

From: s 9(2)(a)
To: s 9(2)(a) @mfe.govt.nz; s 9(2)(a) @mfe.govt.nz
Cc: s 9(2)(a)
Subject: CCC modelling of forest carbon
Date: Wednesday, 15 January 2020 11:21:57 am
Attachments: Outlook-fh331mwe.png

Morena s 9(2)(a)

We've contracted s 9(2)(a) from Concept Consulting to do some economic modelling for us, essentially pulling together the mitigation potential for various parts of the economy into a cohesive picture. Land-use, and particularly forestry, is critical to this, and s 9(2)(a) has spent some time trying to understand carbon calculations in the NIR.

Would you have some time to talk s 9(2)(a) through the NIR model, and how you calculate carbon?

We met with s 9(2)(a) a couple of months ago, who talked s 9(2)(a) through his projections.

Hope you both had a relaxing Christmas and New Year!

s 9(2)(a)

s 9(2)(a)



RELEASED UNDER THE OFFICIAL INFORMATION ACT

From: s 9(2)(a)
To: [REDACTED]
Subject: RE: TRG #4 Land Use + lunch invitation
Date: Wednesday, 4 March 2020 8:54:20 am
Attachments: [image001.png](#)

Hi s 9(2)(a), I didn't get a chance to flag yesterday in the de-intensification small group that it was good to see the re-gen piece in there. There is increasing interest in this and it will be useful to see the evidence base for re gen built/better understood.

Thanks for an interesting session yesterday – sorry couldn't stay the whole time.

Nga mihi

s 9(2)(a)

Ministry for the Environment / Manatū mō te Taiao

Mobile/Waea pūkoro: s 9(2)(a)

Email/Īmēra: s 9(2)(a) -- Website/Pae tukutuku: www.mfe.govt.nz

Address/Wāhi mahi: Environment House, 23 Kate Sheppard Pl, PO Box 10362, Wellington 6143

-----Original Appointment-----

From: s 9(2)(a) <[s 9\(2\)\(a\)@climatecommission.govt.nz](mailto:s 9(2)(a)@climatecommission.govt.nz)>

Sent: Thursday, 23 January 2020 2:11 PM

To: s 9(2)(a)

Cc: s 9(2)(a)

Subject: TRG #4 Land Use + lunch invitation

When: Tuesday, 3 March 2020 12:30 PM-4:30 PM (UTC+12:00) Auckland, Wellington.

Where: Level 21, 1 Willis St (Aon Centre), Wellington

MFE CYBER SECURITY WARNING

This email originated from outside our organisation. Please take extra care when clicking on any links or opening any attachments.

Dear Land Use Technical Reference Group members,

We look forward to meeting you again on Tuesday 3rd March at Level 21, 1 Willis St (Aon Centre).

We would be delighted if you could join us for lunch at 12.30pm with the Transport TRG group members.

****Please RSVP for lunch with Tania Loughlin and indicate any dietary requirements by this Monday: s 9(2)(a) [@climatecommission.govt.nz](mailto:s 9(2)(a)@climatecommission.govt.nz)****

For those who are joining remotely, a Zoom link is at the end of this email.

Please see the agenda below and do not hesitate to ask any question.

AGENDA

12.30pm Lunch with Transport TRG members & CCC staff

1.30pm TRG #4 Land Use meeting starts

Welcome

Update on Climate Change Commission establishment and role of TRGs

Timeframes for our advice

Plan for broader technical engagement

Update on land use mitigation work

Update on overall modelling

Ongoing land use modelling framework

Discussion on how we have used the TRG advice

Explanation of break-out sessions

Coffee Break

Break out session

- a) Trends (global/emerging and regulatory)
- b) management practice (on-farm)
- c) technological change
- d) land use change

Round 1: 15 minutes, Round 2: 10 minute, Round 3: 10 minutes

Wrap-up, report-back.

Next steps

Plans for further TRGs.

Zoom link for remote participants (available until the break out session):

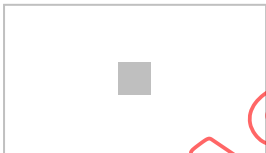
<https://zoom.us/j/827241370?pwd=QTdvKzV4S0FVQWV1dUtoR2dqYm1KOT09>

Meeting ID: 827 241 370

Password: 423296

Join by phone: <https://zoom.us/u/abR19170wu>

On behalf of the Climate Change Commission Land Use team,



s 9(2)(a)

PO Box 24448, Wellington 6142

M s 9(2)(a)

W climatecommission.govt.nz

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s 9(2)(a)

From: s 9(2)(a) @mfe.govt.nz>
Sent: Wednesday, 15 April 2020 3:30 pm
To: s 9(2)(a)
Cc:
Subject: RE: Forests, Herbivores and Carbon Stocks

Categories: LCANZ

Hi s 9(2)(a)

s 9(2)(a) could speak more on the work that has been done around detecting pests, pest control, and the impact on Carbon in forests. I'll forward the invite and see if she can make it.

Cheers,

s 9(2)(a)

From: s 9(2)(a) @climatecommission.govt.nz>
Sent: Wednesday, 15 April 2020 10:45 AM
To: s 9(2)(a) @mfe.govt.nz>; s 9(2)(a) @climatecommission.govt.nz>
Cc: s 9(2)(a) @mfe.govt.nz>
Subject: RE: Forests, Herbivores and Carbon Stocks

s 9(2)(a) mentioned s 9(2)(a) (DOC) has also been involved in this work. Is it worth asking her to sit in on Friday's meeting?

If so, could you forward the invite to her? I think you're aware of why we're asking. Essentially, CCC are giving advice on the first three emissions budgets and emissions reduction plans. We want to ensure that while we might be giving advice on mitigation (e.g. retiring coal boilers) and sequestration (planting new forests), we also want to be sure we're not losing existing carbon stock (e.g. old growth forests).

s 9(2)(a)

From: s 9(2)(a) @mfe.govt.nz>
Sent: Tuesday, 14 April 2020 9:55 am
To: s 9(2)(a) @climatecommission.govt.nz>; s 9(2)(a) @climatecommission.govt.nz>
Cc: s 9(2)(a) @mfe.govt.nz>
Subject: RE: Forests, Herbivores and Carbon Stocks

Hi s 9(2)(a)

Yep that sounds great. It is all pretty speculative at the moment, but would be happy to talk about it.

My schedule is fairly free this week, if you would like to propose a time?

Cheers,

s 9(2)(a)

From: s 9(2)(a) @climatecommission.govt.nz>
Sent: Thursday, 9 April 2020 5:29 PM
To: s 9(2)(a) @mfe.govt.nz>; s 9(2)(a) @climatecommission.govt.nz>
Cc: s 9(2)(a) @mfe.govt.nz>
Subject: Forests, Herbivores and Carbon Stocks

Hi s 9(2)(a)

Hope you're lined up for an exciting Easter weekend of staying at home!

I had a discussion with Nigel this afternoon about the issue of pest control in indigenous forests. He said that you've been doing some good work on what pest control (or lack thereof) might mean for carbon stocks?

Do you have time late next week to have a chat about this?

Thanks
s 9(2)(a)



s 9(2)(a)
w climatecommission.govt.nz

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From: s 9(2)(a)
To: [REDACTED]
Subject: RE: Forests, Herbivores and Carbon Stocks
Date: Friday, 17 April 2020 2:06:11 pm
Attachments: [wild-animal-control-emissions-management.pdf](#)

Hi s 9(2)(a)

Great to catch up today. As discussed here is the WACEM report I mentioned and a brief summary of the updates to natural forest estimates which took the total removals from ~6MT to ~3MT in this year's inventory submissions

The pre-1990 natural forest emissions factors have also been revised for the 2020 submission. A revised analysis of the pre-1990 natural forest plot data was undertaken for the 2020 submission (Paul et al., unpublished(b)). Improvements included:

- using an updated vegetation classification system (Wiser and De Caceres, 2018) to determine the split between tall and regenerating pre-1990 natural forest New Zealand's Greenhouse Gas Inventory 1990–2018 307
- including stem data from circular measurement plots. This eliminated the bias caused by the over-sampling of large stems in the inner 20 metre x 20 metre plots (Paul et al., 2019)
- updating the method of calculating carbon stock and carbon stock changes in the aboveground biomass pool, by applying a 'stem following' method rather than a 'stock change' method (as outlined in Paul et al., unpublished(b)). See section 6.4.2 for further detail
- adding 44 plots measured during 2013–14, as well as including unmeasured plots, using imputation from regression analysis
- updating the method for estimating the dead wood pool, to account for under-sampling in the field measurements (as outlined in Kimberley et al., 2019). See section 6.4.2 for further detail.

Let me know if you have any other queries,

Cheers,

s 9(2)(a)

From: s 9(2)(a) <[REDACTED]@mfe.govt.nz>

Sent: Friday, 17 April 2020 12:57 PM

To: s 9(2)(a) <[REDACTED]@climatecommission.govt.nz>; s 9(2)(a) <[REDACTED]@mfe.govt.nz>; s 9(2)(a) <[REDACTED]@climatecommission.govt.nz>

Subject: RE: Forests, Herbivores and Carbon Stocks

Sorry both,

I'm on child duty now so I'll miss this. Keen to hear the outcome though.

Regards,

s 9(2)

()

-----Original Appointment-----

From: s 9(2)(a) <[REDACTED]@climatecommission.govt.nz>

Sent: Tuesday, 14 April 2020 3:14 PM

To: s 9(2)(a) <[REDACTED]>

Cc: s 9(2)(a) <[REDACTED]>

Subject: Forests, Herbivores and Carbon Stocks

When: Friday, 17 April 2020 1:00 PM-2:00 PM (UTC+12:00) Auckland, Wellington.

Where: <https://zoom.us/j/97181072039?pwd=eW1VSONjV1pIRnlBRmtySCs4S1FUZz09>

You guys able to access Zoom?

X Cutting & Land Use is inviting you to a scheduled Zoom meeting.

Topic: Forests, Herbivores and Carbon Stocks

Time: Apr 17, 2020 01:00 PM Auckland, Wellington

Join Zoom Meeting

<https://zoom.us/j/97181072039?pwd=eW1VS0NjV1plRnlBRmtySCs4S1FUZz09>

Meeting ID: 971 8107 2039

Password: 300132

One tap mobile

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+16699006833,,97181072039#,,#,300132# US (San Jose)

Dial by your location

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+1 669 900 6833 US (San Jose)

+1 253 215 8782 US

+1 301 715 8592 US

+1 312 626 6799 US (Chicago)

+1 346 248 7799 US (Houston)

+1 408 638 0968 US (San Jose)

Meeting ID: 971 8107 2039

Password: 300132

Find your local number: <https://zoom.us/u/abR19170wu>

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Wild Animal Control for Emissions Management (WACEM) research synthesis

Attachment refused under s 18(d), as it is publicly available at: <https://www.doc.govt.nz/globalassets/documents/conservation/threats-and-impacts/animal-pests/wild-animal-control-emissions-management.pdf>

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Landcare Research
Manaaki Whenua

From: s 9(2)(a)
 To:
 Subject: RE: Forests, Herbivores and Carbon Stocks
 Date: Monday, 20 April 2020 3:50:55 pm

Hi s 9(2)(a)

Thanks for sending this through, very timely for stuff to publish this!

I've summarise some of my own thoughts on the key topics that were discussed in the article below.

It was quite a big article which covered quite a bit, so I found I had quite a few points to make... Let me know if you have any further questions. It will be good to touch base with Fiona, Sarah and Elaine to discuss the impact of pests in a bit more detail later this week. (FYI – Sarah Richardson was recently working on classifying tall and regenerating natural forest, and the implications on carbon stock change for us, and knows the more up to date LUCAS data, so will be good to hear her thoughts as well)

Impact of pests

- The point around the impact of pests here is quite an interesting one. That initial changes in carbon stocks may not readily be detected, as most of the carbon is in large trees. However, when these trees die, they may not be replaced due to changes in the understorey due the impact of herbivory preventing regeneration.
- This suggests that we may not see the real impact on long term carbon stocks until years down the line, at which point the damage will already have been done (ie there is a lag on the activity that will drive the change in emissions).
- This could be quite serious in the long term goal to reduce CO2 concentration in the atmosphere, so would be especially important to detect if this is happening across NZ so interventions could be made.
- They outline that pest control can enhance C stocks and sequestration in native forest in a number of ways (similar to those outlined in the WACEM report)
 - Allowing scrub to regenerate into forest (Afforestation; detecting fencing is currently one of the main ways we detect scrub to forest conversions in the map)
 - Allowing regenerating forest to grow faster
 - Allowing tall forest understorey to regenerate
- However, while pests and pest control may be key in driving natural forest carbon stocks and stock change in NZ. The actual outcome of these impacts is not totally clear at this stage.

Importance of carbon stocks

- The importance of considering the carbon stocks, rather than just the carbon flows which allow a yearly emissions figure to be generated is highlighted in the article.
- When I was doing some work on the System of Environmental Economic Accounting (SEEA) ecosystem accounting, there were some interesting discussions around the problem of just taking a sequestration focus to carbon (net C change each year). This is because large areas of natural forest, will tend to be overlooked or overshadowed by decadal growth and harvesting cycles of planted forests.
- There were arguments for more focus to be brought to the carbon stock, rather than just the flow (as in LULUCF), but also scoring the stability of that stock – which I thought was quite an interesting idea.
- This way you could highlight your vulnerable ecosystems where your carbon stock may be at risk. Or highlight your ecosystems with stable stocks and have taken a long time to accumulate that much carbon, which you don't want to then put at risk (ie deforesting old growth forests or draining wetlands generally isn't a good idea, as the carbon is generally quite stable and has taken centuries to millennia to accumulate to those levels). In contrast plantation forest may be considered quite unstable, as they will probably be harvested, but then can regrow very fast if replanted.
- In general I am of the opinion that thinking of the carbons stocks can be quite beneficial. In the context of climate change most people think in terms yearly emissions, which is why

the LULUCF sector has been forced into a framework of yearly CO2 emissions/removals. Sometimes this doesn't always make sense, and some important information is missed. When considering the land, I think trying to maximise the size and stability of long term carbon stocks would be better than focusing on yearly fluctuations in emissions (there is some change towards this with a shift to averaging under Paris).

Payments for not chopping down forest

- In some countries (particularly developing ones), this can make sense as it will usually prevent deforestation events which would otherwise cause a large emission of CO2, that then would be difficult to recover (as there is no forest to regrow).
- However, in NZ, native forest is protected by this for the most part. Even when harvesting is carried, this has to be done sustainably following clear guidelines on minimum removal amounts ect. (The article sort of made out like there is the potential for this to happen a lot – but my understanding is that in reality a very, very low % of native forest on private land is actually harvested (around 0.004% of the standing volume of natural timber on private land is removed each year [based on LUCAS and MPI statistics])
- The one example they provide of receiving payments for not harvesting is an interesting one. Although this may reduce CO2 being emitted on selective logging, there would also be the subsequent gains in carbon as the forest regrows following the disturbance that would need to be considered (plus possibly inputs into HWF). This is likely why credits such as these are not handed out readily in NZ. Nevertheless, I would be interested to know how they calculated their figure of net CO2 carbon offsets each year.
- In reality, I would expect that preventing any sustainable harvesting of the native forests in NZ would likely cause the long term average carbon stock to be a bit higher than it would be with the harvesting taking place. Weather this means it is appropriate to convert to an annual CO2 carbon offset that is then credited each year would remain to be seen...
- However, if it is providing them with some money to manage the forest and reduce pest impacts ect. (as said in this article) then that would be a beneficial outcome.
- I think providing incentives for protecting and enhancing carbon in native forests would be important, but this can be a tricky one to solve with a focus on yearly emissions and a carbon price ect. (perhaps a goal of incentives that maximise the size and stability of the stock in the long term may be a better approach? – which in turn may bring about a measurable change in CO2 removals)

On accounting:

- It argument around age discrimination for accounting towards our targets a bit off. The reason the pre-1990 cut-off is used is to provide a basis for accounting for any *additional* sequestration from proving additional activities that have been taken to drive this. Which is the entire focus of LULUCF under KP. If activities can be demonstrated to improve removals prior to 1990 can be proven, then they will be included.

Cheers,
s 9(2)(a)

From: s 9(2)(a) @climatecommission.govt.nz>

Sent: Sunday, 19 April 2020 8:27 PM

To: s 9(2)(a) @mfe.govt.nz>; s 9(2)(a) @mfe.govt.nz>;

s 9(2)(a) @climatecommission.govt.nz>

Subject: RE: Forests, Herbivores and Carbon Stocks

Did you guys see this article published on stuff over the weekend?

<https://www.stuff.co.nz/environment/climate-news/121052187/can-we-defend-nzs-staggering-natural-carbon-reserves>

We'd be interested to hear your thoughts.

s 9(2)(a)

From: s 9(2)(a)

Sent: Friday, 17 April 2020 9:07 pm

To: s 9(2)(a) @mfe.govt.nz>; s 9(2)(a) @mfe.govt.nz>;

s 9(2)(a) @climatecommission.govt.nz>

Subject: RE: Forests, Herbivores and Carbon Stocks

Thanks s 9(2)(a)

We really appreciated the discussion today. I got a lot of insight from it.

I had a quick scan through the Manaaki Whenua report, and it looks like it covers the pest control and carbon issue fairly well.

s 9(2)(a)

From: s 9(2)(a) <[redacted]@mfe.govt.nz>

Sent: Friday, 17 April 2020 2:06 pm

To: s 9(2)(a) <[redacted]@mfe.govt.nz>; s 9(2)(a)

<[redacted]@climatecommission.govt.nz>; s 9(2)(a)

<[redacted]@climatecommission.govt.nz>

Subject: RE: Forests, Herbivores and Carbon Stocks

Hi s 9(2)(a)

Great to catch up today. As discussed here is the WACEM report I mentioned and a brief summary of the updates to natural forest estimates which took the total removals from ~6MT to ~3MT in this year's inventory submissions

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A revised analysis of the pre-1990 natural forest plot data was undertaken for the 2020 submission (Paul et al., unpublished(b)). Improvements included:

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Let me know if you have any other queries,

Cheers,

s 9(2)(a)

From: s 9(2)(a) <[redacted]@mfe.govt.nz>

Sent: Friday, 17 April 2020 12:57 PM

To: s 9(2)(a) <[redacted]@climatecommission.govt.nz>; s 9(2)(a)

<[redacted]@mfe.govt.nz>; s 9(2)(a)

<[redacted]@climatecommission.govt.nz>

Subject: RE: Forests, Herbivores and Carbon Stocks

Sorry both,

I'm on child duty now so I'll miss this. Keen to hear the outcome though.

Regards,

s 9(2)(a)

-----Original Appointment-----

From: s 9(2)(a) @climatecommission.govt.nz>

Sent: Tuesday, 14 April 2020 3:14 PM

To: s 9(2)(a)

Cc: s 9(2)(a)

Subject: Forests, Herbivores and Carbon Stocks

When: Friday, 17 April 2020 1:00 PM-2:00 PM (UTC+12:00) Auckland, Wellington.

Where: <https://zoom.us/j/97181072039?pwd=eW1VSONjV1pIRnlBRmtySCs4S1FUZz09>

You guys able to access Zoom?

X Cutting & Land Use is inviting you to a scheduled Zoom meeting.

Topic: Forests, Herbivores and Carbon Stocks

Time: Apr 17, 2020 01:00 PM Auckland, Wellington

Join Zoom Meeting

<https://zoom.us/j/97181072039?pwd=eW1VSONjV1pIRnlBRmtySCs4S1FUZz09>

Meeting ID: 971 8107 2039

Password: 300132

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+1 253 215 8782 US

+1 301 715 8592 US

+1 312 626 6799 US (Chicago)

+1 346 248 7799 US (Houston)

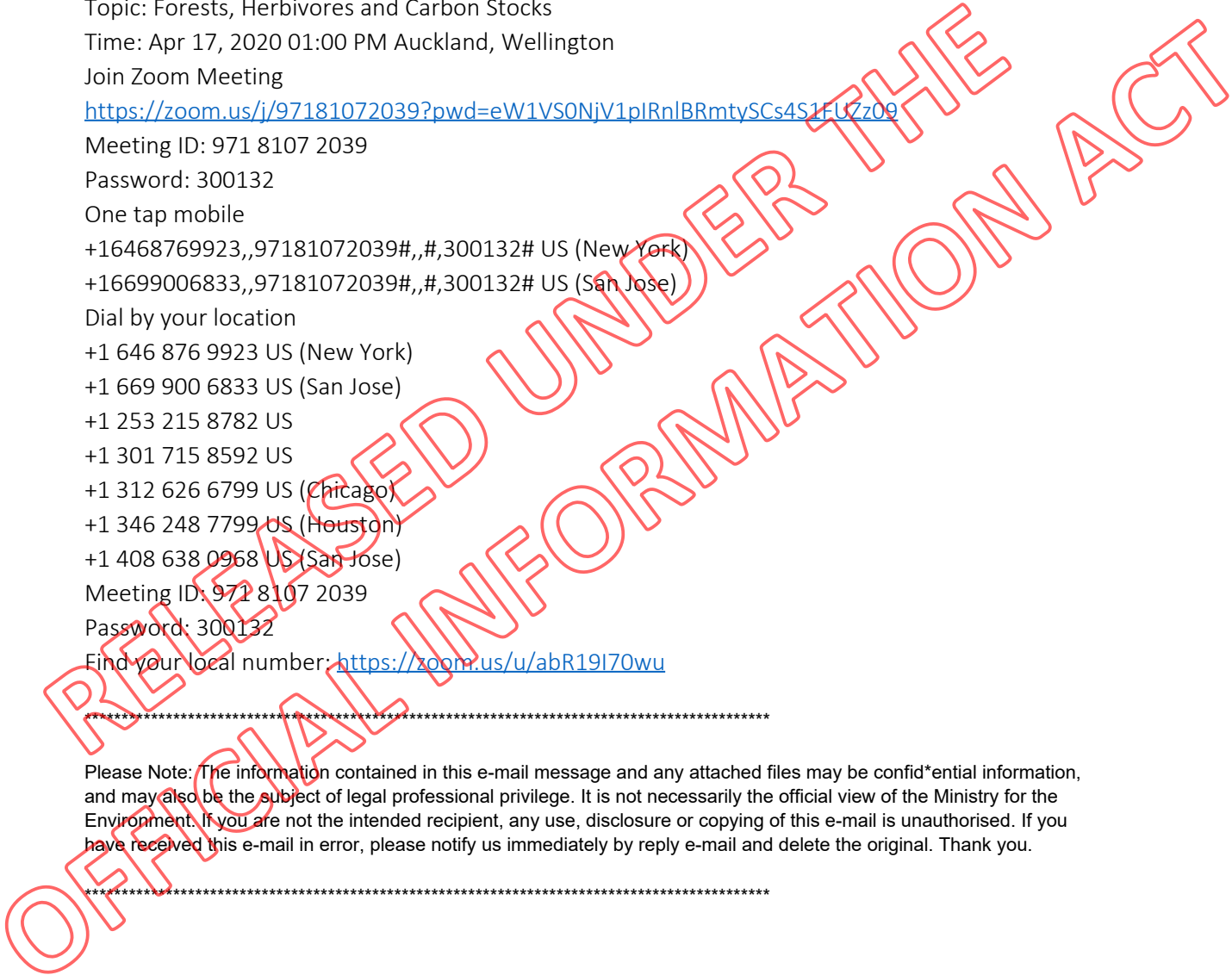
+1 408 638 0968 US (San Jose)

Meeting ID: 971 8107 2039

Password: 300132

Find your local number: <https://zoom.us/u/abR19I70wu>

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s 9(2)(a)

From: s 9(2)(a) @mfe.govt.nz>
Sent: Friday, 24 April 2020 11:39 am
To: s 9(2)(a)
Cc:
Subject: RE: [UNCLASSIFIED] call?

Categories: LCANZ

Hi s 9(2)(a)

I can definitely help you as the related reporting has been a key part of my role in the C19 response.

Next week is looking really busy (L3 change).

Can we talk this afternoon at 2pm?

Sorry for the late notice.

Cheers

s 9(2)(a)

From: s 9(2)(a) @climatecommission.govt.nz>
Sent: Thursday, 23 April 2020 2:41 PM
To: s 9(2)(a) @mfe.govt.nz>
Cc: s 9(2)(a) @climatecommission.govt.nz>
Subject: [UNCLASSIFIED] call?

[UNCLASSIFIED]

Hi s 9(2)(a)

Hope you're doing well so far keeping our whole waste sector going.

You would have seen in my email yesterday to the waste TRG that the climate change commission have been asked to look at the long-term impacts of COVID on the waste sector.

s 9(2)(a) suggested it might be quicker for me to set up a 15-30 minute conversation between us to pick your brain.

I realize you're busy – but if you had anytime between tomorrow and next Thursday I'd be grateful for any time and insight you might offer.

Let me know what you think

Thanks,

**CLIMATE
CHANGE
COMMISSION**

s 9(2)(a)

W climatecommission.govt.nz

[UNCLASSIFIED]

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s 9(2)(a)

From: s 9(2)(a) @mfe.govt.nz>
Sent: Friday, 24 April 2020 1:42 pm
To: s 9(2)(a)
Cc:
Subject: RE: Native forests and pests

Categories: LCANZ

Sorry I missed this all, it has been a tough day with the kids at home.

I realised Phil, that I didn't get back to you on the afforestation on Crown land work we did in '16. There was quite a bit of work done by LINZ and DOC and I believe only 30,000 ha was identified. Do you want me to follow that up?

s 9(2)(a)

From: s 9(2)(a) @mfe.govt.nz>
Sent: Friday, 24 April 2020 11:10 AM
To: s 9(2)(a) @climatecommission.govt.nz>; s 9(2)(a) @landcareresearch.co.nz;
s 9(2)(a) @doc.govt.nz; s 9(2)(a) @climatecommission.govt.nz>; s 9(2)(a) @landcareresearch.co.nz
Cc: s 9(2)(a) @mfe.govt.nz>; s 9(2)(a) @mfe.govt.nz>
Subject: RE: Native forests and pests

Thanks for the meeting all.

The MPI analyst mentioned at the end that this may have been s 9(2)(a) I believe she is a s 9(2)(a) in Te Uru Rakau (just had a quick search through my email).

-----Original Appointment-----

From: s 9(2)(a) @climatecommission.govt.nz>
Sent: Tuesday, 21 April 2020 5:30 PM
To: s 9(2)(a) @landcareresearch.co.nz; s 9(2) @doc.govt.nz; s 9(2)(a) @landcareresearch.co.nz
Cc: s 9(2)(a)
Subject: Native forests and pests
When: Friday, 24 April 2020 10:05 AM-11:05 AM (UTC+12:00) Auckland, Wellington.
Where: <https://zoom.us/j/95264636767?pwd=bFdFSVR1QXIVRGUzV3FBbHNxRmZuUT09>

Updated details:

Aim: To discuss pests and native forests regeneration/establishments and implications for carbon sinks and removals

Zoom link: <https://zoom.us/j/95264636767?pwd=bFdFSVR1QXIVRGUzV3FBbHNxRmZuUT09>

Meeting ID: 952 6463 6767

Password: 176553

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OFFICIAL INFORMATION ACT

s 9(2)(a)

From: s 9(2)(a) @mfe.govt.nz>
Sent: Wednesday, 3 June 2020 12:37 pm
To: s 9(2)(a)
Cc:
Subject: RE: Request for access to municipal waste model

Categories: LCANZ

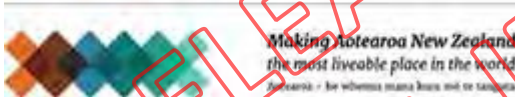
Hi s 9(2)(a)

Ok – that’s kinda what I thought but just wanted to check.

s 9(2)
 Hi (a) I would suggest that our department can provide data on waste tonnages going to levied landfills in NZ to you. It would need to be in an aggregated form and not for specific landfills or regions due to some commercial sensitivity.

s 9(2)(a)

Ministry for the Environment – Manatū Mō Te Taiao
 Environment House, 23 Kate Sheppard Place, Thorndon, Wellington 6143



From: s @mfe.govt.nz>
Sent: Wednesday, 3 June 2020 12:34 PM
To: s 9(2)(a) @mfe.govt.nz>; s 9(2)(a) @climatecommission.govt.nz>
Cc: s 9(2)(a) @climatecommission.govt.nz>
Subject: RE: Request for access to municipal waste model

Oh – I encouraged the commission to request access to the *levy data* from you (which is a central part of the municipal waste model that I hold). So, if you do a word swap from “municipal waste model” to “levy data” (as used in the model) then the email should read correctly 😊

The reason I suggested the commission contact you is because I wasn’t willing to share the levy data without it going through the appropriate chains.

Cheers

s 9(2)(a)

Weather forecast:  indoors as we unite against COVID-19 ~

From: s 9(2)(a) [@mfe.govt.nz](mailto:s 9(2)(a)@mfe.govt.nz)>

Sent: Wednesday, 3 June 2020 12:23 PM

To: s 9(2)(a) [@climatecommission.govt.nz](mailto:s 9(2)(a)@climatecommission.govt.nz)>; s 9(2)(a) [@mfe.govt.nz](mailto:s 9(2)(a)@mfe.govt.nz)>

Cc: s 9(2)(a) [@climatecommission.govt.nz](mailto:s 9(2)(a)@climatecommission.govt.nz)>

Subject: RE: Request for access to municipal waste model

Afternoon s 9(2)(a)

Thanks for getting in touch.

Can I just clarify what it is you are looking for? We do not hold any models on waste emissions from landfills.

Our role is to monitor levied landfills for their obligations under the Waste Minimisation Act.

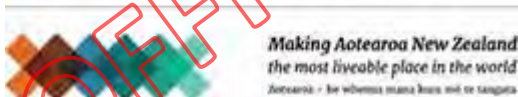
We hold information on the tonnages of waste that are disposed to levied landfills – this is required to ascertain the amount of levy payable as required by the Act.

Chris – has there been a break down in communication somewhere?

Kind Regards

s 9(2)(a)

Ministry for the Environment – Manatū Mō Te Taiao
Environment House, 23 Kate Sheppard Place, Thorndon, Wellington 6143



From: s 9(2)(a) [@climatecommission.govt.nz](mailto:s 9(2)(a)@climatecommission.govt.nz)>

Sent: Wednesday, 3 June 2020 11:42 AM

To: s 9(2)(a) [@mfe.govt.nz](mailto:s 9(2)(a)@mfe.govt.nz)>

Cc: s 9(2)(a) @climatecommission.govt.nz>

Subject: Request for access to municipal waste model

Kia Ora s 9(2)(a)

Hope you're well today.

s 9(2)(a) mentioned that you were the person we should contact regarding access to the managed municipal sions model. He also mentioned StatsNZ has recently requested this information.

We'd like to also request access to this model.

The Climate Commission is currently preparing analysis and advice on how New Zealand might be able to reduce greenhouse gas emissions. This will be considered by Ministers, who are required (under the Climate Change Response Act) to set an Emissions Reduction Plan by the end of 2021. The emissions budgets will likely have impacts on the waste sector.

In order to produce accurate, reliable advice for our emissions budgets we need to ensure that we're getting accurate and reliable information and that this is consistent with the information held by other government departments. This will also help us ensure any advice we give is based on a data source common with MfE.

The municipal waste emissions model will enable us to model the different scenarios regarding landfill gas capture, waste reduction and other policies and technologies to a much greater level than if we just had general data.

It will also enable us to better understand the Ministry for the Environment's modelling of waste streams and the impact that historic options have had on the work.

Please don't hesitate to get in touch with me if you have any questions or if you have anything you want clarified.

Thanks,
s 9(2)(a)

CLIMATE CHANGE COMMISSION
s 9(2)(a)
w climatecommission.govt.nz

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s 9(2)(a)

From: s 9(2)(a) @mfe.govt.nz>
Sent: Wednesday, 3 June 2020 12:44 pm
To: s 9(2)(a)
Cc:
Subject: RE: Request for access to municipal waste model

Categories: LCANZ

Hi s 9(2)(a)

That's the challenge, the waste model contains levy data for individual landfills. [We already publish aggregated data \(table 7.2.3, 2010 onwards\)](#). I am hoping there is a way for the commission to get access to this disaggregated data. For instance do we need to initiate a data sharing request with the individual landfill operators?

Cheers

s 9(2)(a)

Weather forecast: 🌧 indoors as we unite against COVID-19 ~

From: s 9(2)(a) @mfe.govt.nz>
Sent: Wednesday, 3 June 2020 12:37 PM
To: s 9(2)(a) @mfe.govt.nz>; s 9(2)(a) @climatecommission.govt.nz>
Cc: s 9(2)(a) @climatecommission.govt.nz>
Subject: RE: Request for access to municipal waste model

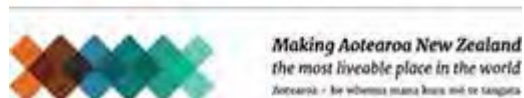
Hi s 9(2)(a)



Ok – that's kinda what I thought but just wanted to check.

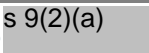
s 9(2)(a)
Hi I would suggest that our department can provide data on waste tonnages going to levied landfills in NZ to you. It would need to be in an aggregated form and not for specific landfills or regions due to some commercial sensitivity.

s 9(2)(a)

Ministry for the Environment – Manatū Mō Te Taiao
Environment House, 23 Kate Sheppard Place, Thorndon, Wellington 6143



From: s 9(2)(a)
 To: 
 Cc: 
 Subject: RE: [UNCLASSIFIED] FW: Request for access to municipal waste model
 Date: Thursday, 11 June 2020 2:15:39 pm
 Attachments: [image001.jpg](#)
[image002.png](#)
[image003.png](#)
[image004.png](#)
[image005.png](#)
[image007.png](#)
[image010.png](#)

Yes, please send this to 

One point of clarification, the municipal waste model contains **disaggregated levy data**, hence the confidentiality issues, and why we're needing to work with Nigel to give you access. The [aggregated data is already published](#) (table 7.2.3, 2010 onwards) in the NIR.

As for your two questions, I will answer those since I don't know when you'll get access to the model. Can you please clarify if this is what you're after. Specifically, do you mean no waste added from 2021 inclusive? Secondly, calculating & projecting average efficiency is not straightforward. To do this, I have taken an average of the recovery efficiency weighted against the CH₄ *generated* for a specific subset of managed landfills. This has several implications:

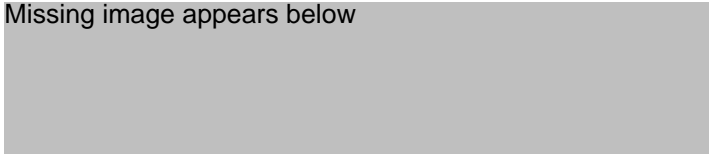
- To project this value, the projected methane generated depends on the waste disposed at the landfill, so the weighted average changes depending on whether projected waste volumes are included or not.
- Note that the actual recovery efficiencies for each individual landfill are projected to be constant both in the past and future for all years (starting from when the landfill started collecting gas). The overall change in efficiency reflects more landfills starting to collect gas (often at high efficiencies) and changing distribution of waste between each landfill. The only exceptions to having constant efficiency are:
 - Where the landfill slowly increased efficiency to begin with
 - Where we have UEF data, which is on a per-year, per-landfill basis
- Somewhat arbitrarily, it is also not an average across *all* managed landfills, since it only covers landfills that have had a recovery system at any point in time. If you wish the weighted average to be an average for all managed landfills, including landfills that never had recovery, let me know.

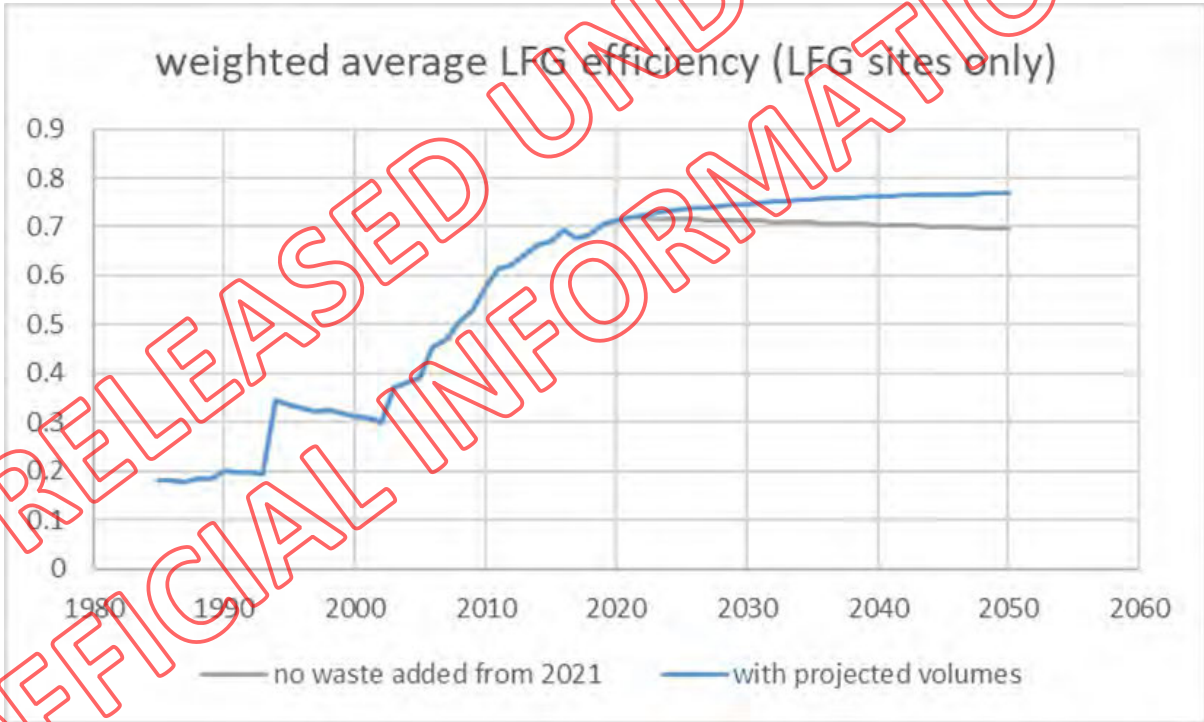
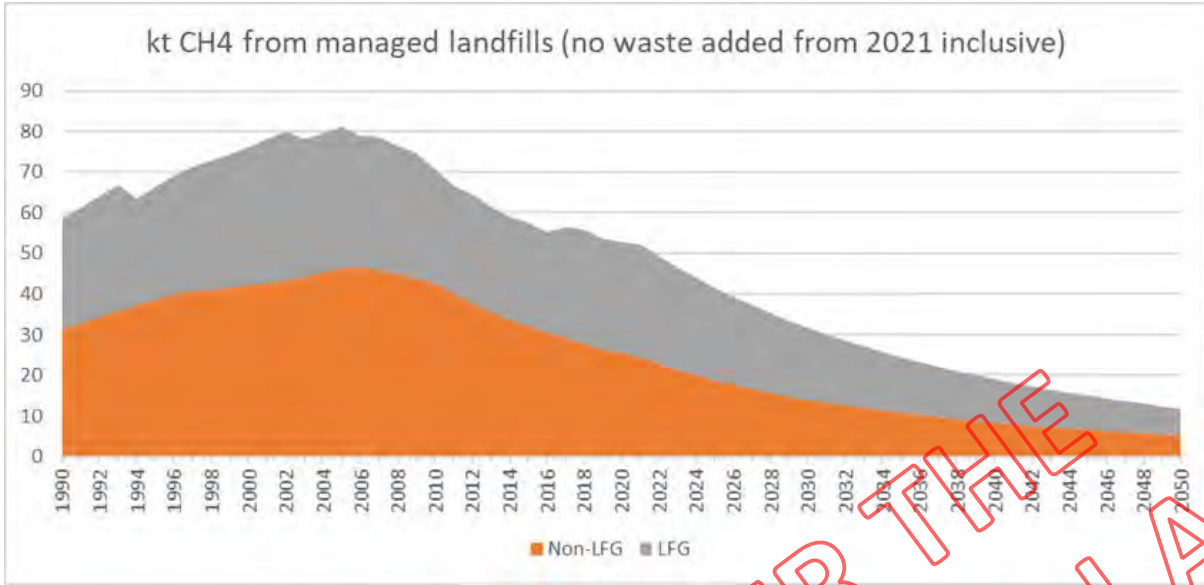
Given all this, it might be simpler to take the efficiency for 2020 (or thereabouts) and consider that it is held constant.

I can send this data again (in table form too) once you can clarify what you're after.

Cheers

Missing image appears below





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Missiing image appears above

s 9(2)(a)

Weather forecast: 🌤 indoors as we unite against COVID-19

From: s 9(2)(a) @climatecommission.govt.nz

Sent: Wednesday, 10 June 2020 10:34 AM

To: s 9(2)(a) @climatecommission.govt.nz; s 9(2)(a) @mfe.govt.nz

Subject: RE: [UNCLASSIFIED] FW: Request for access to municipal waste model

Hey s 9(2)(a)

I think it's probably best to go straight to Nigel.

s 9(2)(a)

From: s 9(2)(a) @climatecommission.govt.nz

Sent: Wednesday, 10 June 2020 7:09 am

To: s 9(2)(a) @mfe.govt.nz

Cc: s 9(2)(a) @climatecommission.govt.nz

Subject: FW: [UNCLASSIFIED] FW: Request for access to municipal waste model

[UNCLASSIFIED]

Kia ora s 9(2)(a)

I hope you're well and enjoying the end of lockdown.

If possible, it would be great to have full access to all of the data so we can model specific policies (for example the impact of sending more waste to sites with higher rates of landfill gas capture).

However, if that's not, then national aggregated data should be okay. Would it be possible to provide us with the same **nationally aggregated version of the municipal waste model that you provided Eunomia?**

If we don't have access to the municipal waste model, we were hoping that we could request some information from your model and from your team.

Specifically we would like to know:

- What are the yearly baseline emissions from 2021 onwards if we assume that there is no more waste generated (so – the remaining committed emissions from the decay of existing waste in landfills)
- What is the current and projected average landfill gas capture efficiency across municipal landfill sites in NZ?

Would it be possible to get this information by end of day Wednesday next week please?

Many thanks,

s 9(2)(a)

[UNCLASSIFIED]

From: s 9(2)(a) <[redacted]@climatecommission.govt.nz>

Sent: Wednesday, 3 June 2020 1:21 pm

To: s 9(2)(a) <[redacted]@climatecommission.govt.nz>

Subject: RE: Request for access to municipal waste model

s 9(2)(a) [redacted] just gave me a call. He suggests asking for the same data that goes into the GHG Inventory. That data is disaggregated, which I think is what we need?

s 9(2)(a) [redacted]

From: s 9(2)(a) [redacted]

Sent: Wednesday, 3 June 2020 1:15 pm

To: s 9(2)(a) <[redacted]@climatecommission.govt.nz>

Subject: FW: Request for access to municipal waste model

Could you reply to Nigel if that will suit?

Will the aggregated form have enough detail?

s 9(2)(a) [redacted]

From: s 9(2)(a) <[redacted]@mfe.govt.nz>

Sent: Wednesday, 3 June 2020 12:37 pm

To: s 9(2)(a) <[redacted]@mfe.govt.nz>; s 9(2)(a) <[redacted]@climatecommission.govt.nz>

Cc: s 9(2)(a) <[redacted]@climatecommission.govt.nz>

Subject: RE: Request for access to municipal waste model

Hi s 9(2)(a) [redacted]

Ok – that's kinda what I thought but just wanted to check.

Hi s 9(2)(a) [redacted] would suggest that our department can provide data on waste tonnages going to levied landfills in NZ [redacted] u. It would need to be in an aggregated form and not for specific landfills or regions due to some commercial sensitivity.

s 9(2)(a) [redacted]

Ministry for the Environment – Manatū Mō Te Taiao
Environment House, 23 Kate Sheppard Place, Thorndon, Wellington 6143

MfE_logo



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s 9(2)(a)

From: s 9(2)(a) @mfe.govt.nz>
Sent: Wednesday, 24 June 2020 3:38 pm
To: s 9(2)(a)
Subject: RE: MfE TRG observer - and a chat sometime?

Categories: LCA NZ

Good to see that you are responding promptly to emails!

Next week would be good but I'll work from home on Tuesday and Wednesday is pretty packed.

How about Thursday 2 July sometime after 10? The more the merrier!

s 9(2)(a)

From: s 9(2)(a) @climatecommission.govt.nz>
Sent: Wednesday, 24 June 2020 2:28 PM
To: s 9(2)(a) @mfe.govt.nz>
Subject: RE: MfE TRG observer - and a chat sometime?

How are you looking for Tuesday next week, say at 1pm?

Congrats on your new position! I can bring in a couple of other managers given that you've now got a wider role?

s 9(2)(a)

From: s 9(2)(a) @mfe.govt.nz>
Sent: Wednesday, 24 June 2020 2:22 pm
To: s 9(2)(a) @climatecommission.govt.nz>
Subject: RE: MfE TRG observer - and a chat sometime?

G'dday s 9(2)(a) keen to discuss, give me a call whenever or else lets discuss over coffee

s 9(2)(a)

From: s 9(2)(a) @climatecommission.govt.nz>
Sent: Wednesday, 27 May 2020 9:28 AM
To: s 9(2)(a) @mfe.govt.nz>
Subject: MfE TRG observer - and a chat sometime?

Hi s 9(2)(a)

I left you a phone message a couple of weeks ago, but haven't got around to following up.

Do you have a person who can take over s 9(2)(a) previous role as observer on the land-use technical reference group for the Commission?

Would be good to have a chat with you soon about what you're up to on agricultural policy. We're starting to turn our thinking towards how we develop advice for this, and can be more effective if we know the latest lie of the land.

s 9(2)(a)



s 9(2)(a)

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s 9(2)(a)

From: s 9(2)(a) @mfe.govt.nz>
Sent: Tuesday, 30 June 2020 9:57 am
To: s 9(2)(a)
Subject: RE: Counting Forests' emissions and removals in budgets and targets
Categories: LCANZ

Thanks all,

Just for clarity, that is Ministry for the Environment. A couple of LUCAS people should join, so I might try and find a bigger room.

s 9(2)(a)

From: s 9(2)(a) @climatecommission.govt.nz>
Sent: Tuesday, 30 June 2020 9:54 AM
To: s 9(2)(a) @climatecommission.govt.nz>; s 9(2)(a) @mfe.govt.nz>; s 9(2)(a) @mpi.govt.nz>; s 9(2)(a) @climatecommission.govt.nz>; s 9(2)(a) @mpi.govt.nz>; s 9(2)(a) @climatecommission.govt.nz>; s 9(2)(a) @mpi.govt.nz>; s 9(2)(a) @climatecommission.govt.nz>; s 9(2)(a) @mfe.govt.nz>
Subject: RE: Counting Forests' emissions and removals in budgets and targets

-UPDATE-

We have a room booked at MoE, Meeting room EH 6B. Thanks for helping with this s 9(2)(a)

Our meeting rooms our still being built here at the CCC, but we look forward to hosting you for meetings in the near future.

Ngā mihi

s 9(2)(a)

-----Original Appointment-----

From: s 9(2)(a) @climatecommission.govt.nz>
Sent: Rāmere, 26 Pipiri, 2020 9:34 a.m.
To: s 9(2)(a)
Subject: Counting Forests' emissions and removals in budgets and targets
When: Rāpare, 02 Hōngongoi, 2020 1:00 p.m.-2:30 p.m. (UTC+12:00) Auckland, Wellington.
Where: Meetingroom EH 6B

-UPDATE-

We have a room booked at MoE, [Meeting room EH 6B](#). Thanks for helping with this, s 9(2)(a)

Our meeting rooms our still being built here at the CCC, but we look forward to hosting you for meetings in the near future.

Ngā mihi

s 9(2)(a)

Afternoon all,

I think you are all aware that the Commission will need to give advice on how NZ tracks progress towards meeting emissions budgets and targets. This includes how we account for emissions and removals from land-use.

s 9(2)(a)

have been doing some thinking about the options, and it'd be good to test some of this thinking with you.

I've (probably optimistically) put something in for next week. Could you please accept/decline quickly so I know whether I need to move this?

Thanks.
s 9(2)(a)

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s 9(2)(a)

From: s 9(2)(a) @mfe.govt.nz>
Sent: Tuesday, 30 June 2020 8:47 am
To: s 9(2)(a)
Subject: RE: Counting Forests' emissions and removals in budgets and targets

Categories: LCANZ

Just checking, I can only get a half room seating up to 8.

From: s 9(2)(a) @climatecommission.govt.nz>
Sent: Monday, 29 June 2020 8:37 PM
To: s 9(2)(a) @mfe.govt.nz>
Subject: RE: Counting Forests' emissions and removals in budgets and targets

In response to your text, we give the advice on accounting in May 2021 (assuming it's changed from Feb). But we need to get a draft of our advice finalised by Oct/Nov so we can go and consult on it in January.

Let me know if you can't find a room, and I'll ask s 9(2)(a) if he can find something at MPI.

s 9(2)(a)

From: s 9(2)(a)
Sent: Monday, 29 June 2020 3:16 pm
To: s 9(2)(a) @mfe.govt.nz>
Subject: RE: Counting Forests' emissions and removals in budgets and targets

Was wondering about s 9(2)(a) I'll chat to s 9(2)(a)

Yes please, if you could book a room.

s 9(2)(a)

From: s 9(2)(a) @mfe.govt.nz>
Sent: Monday, 29 June 2020 9:01 am
To: s 9(2)(a) @climatecommission.govt.nz>
Subject: RE: Counting Forests' emissions and removals in budgets and targets

This starts getting pretty big but I was also thinking about s 9(2)(a) as she is looking at the budgets from our perspective.

I can only find a half room that seats possibly up to 8, is that going to work?

From: s 9(2)(a) @climatecommission.govt.nz>
Sent: Friday, 26 June 2020 4:41 PM
To: s 9(2)(a) @mfe.govt.nz>
Subject: RE: Counting Forests' emissions and removals in budgets and targets

Ah yes! s 9(2)(a)

Our meeting rooms are still out of action. Any chance you could host?

Tues and Weds would be difficult, but I'll see if I can arrange something.

s 9(2)(a)

-----Original Appointment-----

From: s 9(2)(a) @mfe.govt.nz>

Sent: Friday, 26 June 2020 9:59 am

To s 9(2)(a)

Subject: Accepted: Counting Forests' emissions and removals in budgets and targets

When: Thursday, 2 July 2020 1:00 pm-2:30 pm (UTC+12:00) Auckland, Wellington.

Where:

I'd rather do Tuesday or Wednesday, but this could work. At your digs?

I'll invite s 9(2)(a) What about s 9(2)(a)

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From: s 9(2)(a)
To: [Redacted]
Subject: AR4 vs AR5
Date: Thursday, 30 July 2020 2:46:18 pm
Attachments: [image001.png](#)

Hi s 9(2)(a)

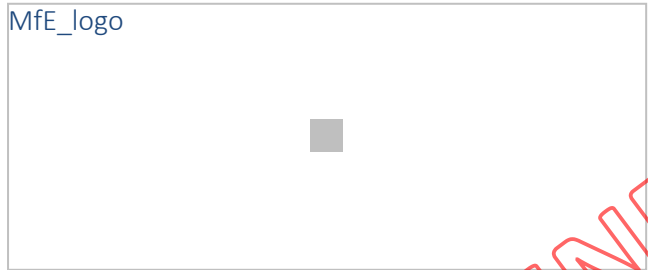
We need to meet for coffee.

Are you guys looking at GWPs AR4 vs AR5 in your NDC advice? I would be helpful if you are.

s 9(2)(a)
[Redacted]

Ministry for the Environment – Manatū Mō Te Taiao

s 9(2)(a)
23 Kate Sheppard Place, PO Box 10362, Wellington 6143



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s 9(2)(a)

From: s 9(2)(a) @mfe.govt.nz>
Sent: Thursday, 17 September 2020 12:11 pm
To: s 9(2)(a)
Cc:
Subject: RE: [UNCLASSIFIED] RE: Discussing the Emission Budgets process with the HWEN Pricing workstream

Categories: LCANZ

Hi s 9(2)(a)

I'm happy to have a quick chat to you both about this. How are you placed tomorrow? I'm free after 1pm if that works for you and s 9(2)(a)

Cheers,

s 9(2)(a)

From: s 9(2)(a) @climatecommission.govt.nz>
Sent: Tuesday, 15 September 2020 5:06 pm
To: s 9(2)(a) @mfe.govt.nz>
Cc: s 9(2)(a) @climatecommission.govt.nz>
Subject: [UNCLASSIFIED] RE: Discussing the Emission Budgets process with the HWEN Pricing workstream

[UNCLASSIFIED]

Hi s 9(2)(a)

The people to talk to are probably me and s 9(2)(a) an you let us know a bit more about what you are after for this? If it's easiest to do that over a teams chat or something, we're happy to do that.

Cheers

s 9(2)(a)

[UNCLASSIFIED]

From: s 9(2)(a) @mfe.govt.nz>
Sent: Monday, 14 September 2020 4:40 pm
To: s 9(2)(a) @climatecommission.govt.nz>
Subject: Discussing the Emission Budgets process with the HWEN Pricing workstream

Hi s 9(2)(a)

Thanks again for chatting to us about the ICCA free allocation process!

I was wondering if someone from the Commission could come and have a chat to the pricing workstream at our meeting on Tuesday afternoon next week about the Emission Budget process and how the potential ag emissions pricing mechanism links into these. This forms part of the allocation discussion and getting a common understanding of what we are doing via He Waka links into the broader climate framework.

Who is the best person to chat to about this?

Cheers,

s 9(2)(a)



Address/Wāhi mahi: Environment House, 23 Kate Sheppard Pl, PO Box 10362, Wellington 6143



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Aotearoa - he whenua mana kura mō te tangata



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s 9(2)(a)

From: s 9(2)(a) @mfe.govt.nz>
Sent: Wednesday, 30 September 2020 2:10 pm
To: s 9(2)(a)
Subject:
Attachments: How pricing emissions supports the low emissions transition at manageable cost to the economy.pptx
Categories: LCANZ

Kia ora kōrua

Just wanted to say thanks for hosting yesterday’s meeting and the opportunity for some informal sharing of emerging thinking and common context.
 And in that spirit I thought I’d share with you fyi an infographic I’ve developed and occasionally find useful ... and that relates to/supports the three pillars approach.
 This has no particular status, although we did include something similar in the RIS for the pricing agriculture emissions response to the iCCC’s report last year.
 Also, being a bit of a policy wonk, I just thought I’d pick up on the use of the word ‘Crown’ that came from one or two on our side of the table.
 I think we should rather talk in terms of the Commission and the Government (because we are in fact both part of the Crown).
 More specifically, the Commission fulfilling its independent expert advisory and monitoring roles, and the Government responding by considering that advice, setting budgets, developing remissions reduction plans, etc. (and being held to account under the CCRA through the Commission and Parliament).
 (I just raise this in case the language used at the meeting was in any risk of being picked up in meeting notes etc. and gaining currency.
 Obviously we all understand the dynamic established by the CCRA – and obviously we all have much more important things than mere semantics to worry about!)
 Thanks again for the excellent approach to engagement with us officials.
 ngā mihi

s 9(2)(a)

My standard working days are Monday - Thursday.

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How pricing emissions supports the low emissions transition at manageable cost to the economy

Marginal abatement cost & emissions price
(\$/tCO₂-e)

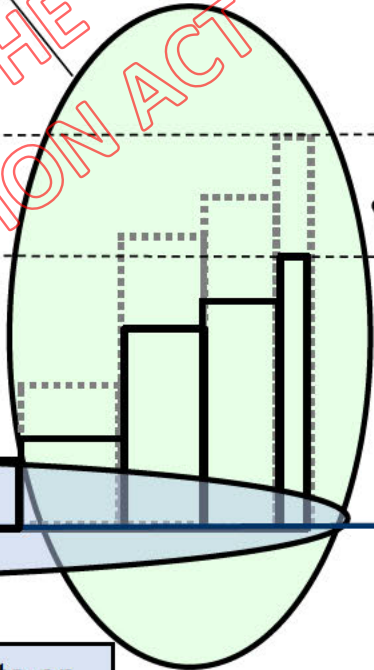
R&D and earlier investment in innovation:
• reduces long-term costs of new technology
• accelerates scale-up & widespread uptake
(NB: other technology support policies needed)

*Adapted from Hood, C. (2011),
Summing up the Parts: Combining
Policy Instruments for Least-Cost
Climate Mitigation Strategies
OECD/IEA, Paris.*

Emissions pricing provides an investment signal to help reduce long-term marginal abatement cost

Emissions price gives a financial incentive for all mitigation options with a lower abatement cost, wherever these occur across the economy
(Other policies may still be needed to overcome non-economic barriers)

Rising emissions price makes more mitigation options become economic



Costed options for emissions abatement
(MtCO₂-e)

Emissions pricing focuses attention on untapped abatement opportunities at low or negative cost

Alternatively government can regulate or directly invest in mitigation options
(trading off a lower emissions price against wider economic efficiency)

Cost-effective options blocked by non-economic barriers
(NB: other policies and support needed to overcome barriers)

0

From: s 9(2)(a)
To: [Redacted]
Cc: [Redacted]
Subject: Evidence CH Sector Focus Removals - Options Challenges MfE VIEW
Date: Tuesday, 24 November 2020 12:07:00 pm
Attachments: [Evidence CH Sector Focus Removals - Options Challenges SENT FOR REVIEW.docx](#)

Hi s 9(2)(a)

Sorry for the delay, here is our feedback on the removals document you sent through.

Let us know if you have any queries.

Regards,

s 9(2)(a)

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Attachment withheld in full under 9(2)(g)(i).

Final version of the chapter is available at: <https://ccc-production-media.s3.ap-southeast-2.amazonaws.com/public/evidence/advice-report-DRAFT-1ST-FEB/Evidence-CH-05-Removing-carbon-from-our-atmosphere-19-Jan-2021.pdf>

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s 9(2)(a)

From: s 9(2)(a) @mfe.govt.nz>
Sent: Thursday, 26 November 2020 2:43 pm
To: s 9(2)(a)
Cc:
Subject: Emissions reductions through carbon stored in HWP and the substitution effects of these products
Attachments: ffgc-03-00058.pdf
Categories: LCANZ

Hi s 9(2)(a)

I had a hunt for the paper I was talking about which demonstrated the emissions abatement potential from carbon stored in forests, carbon stored in HWP and emissions avoided from substitution effects.

I couldn't find the specific paper I had in mind, but I did come across a few other articles which show similar things, have copied in the key graphs and links below.

I've also attached a short perspective paper which I though summarised how different types of forestry can be viewed in the context of decarbonisation (not all issues may apply to NZ)

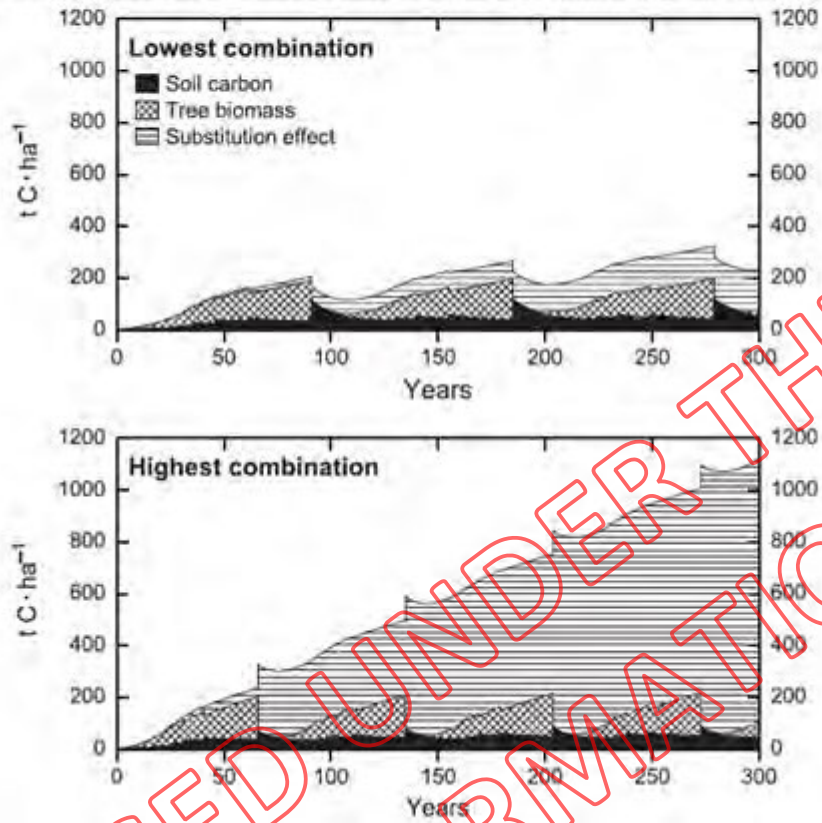
Emissions reductions through the substitution effects of harvested wood products

Integrated carbon analysis of forest management practices and wood substitution

Erik Eriksson, Andrew R. Gillespie, Leif Gustavsson, Ola Langvall, Mats Olsson, Roger Sathre, and Johan Stendahl
<https://cdnsiencepub.com/doi/abs/10.1139/X06-257?journalCode=cjfr>

Cumulative Carbon per hectare from forest biomass, soils and substitution effects under different management regimes

Fig. 3. Development over time of the carbon stock in the soil (including undecomposed litter) and in the living tree biomass, and accumulated carbon emission reduction due to product substitution for the combination of parameters giving the lowest reduction in net carbon emission (traditional regime, slash and stumps remaining on site, products used as biofuel, and natural gas as the reference fossil fuel; upper panel) and for the combination of parameters giving the highest reduction in net carbon emission (fertilization regime, removal of both slash and stumps for use as biofuel, products used as construction material, and coal as the reference fossil fuel; lower panel).



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2. Potential Roles of Swedish Forestry in the Context of Climate Change Mitigation

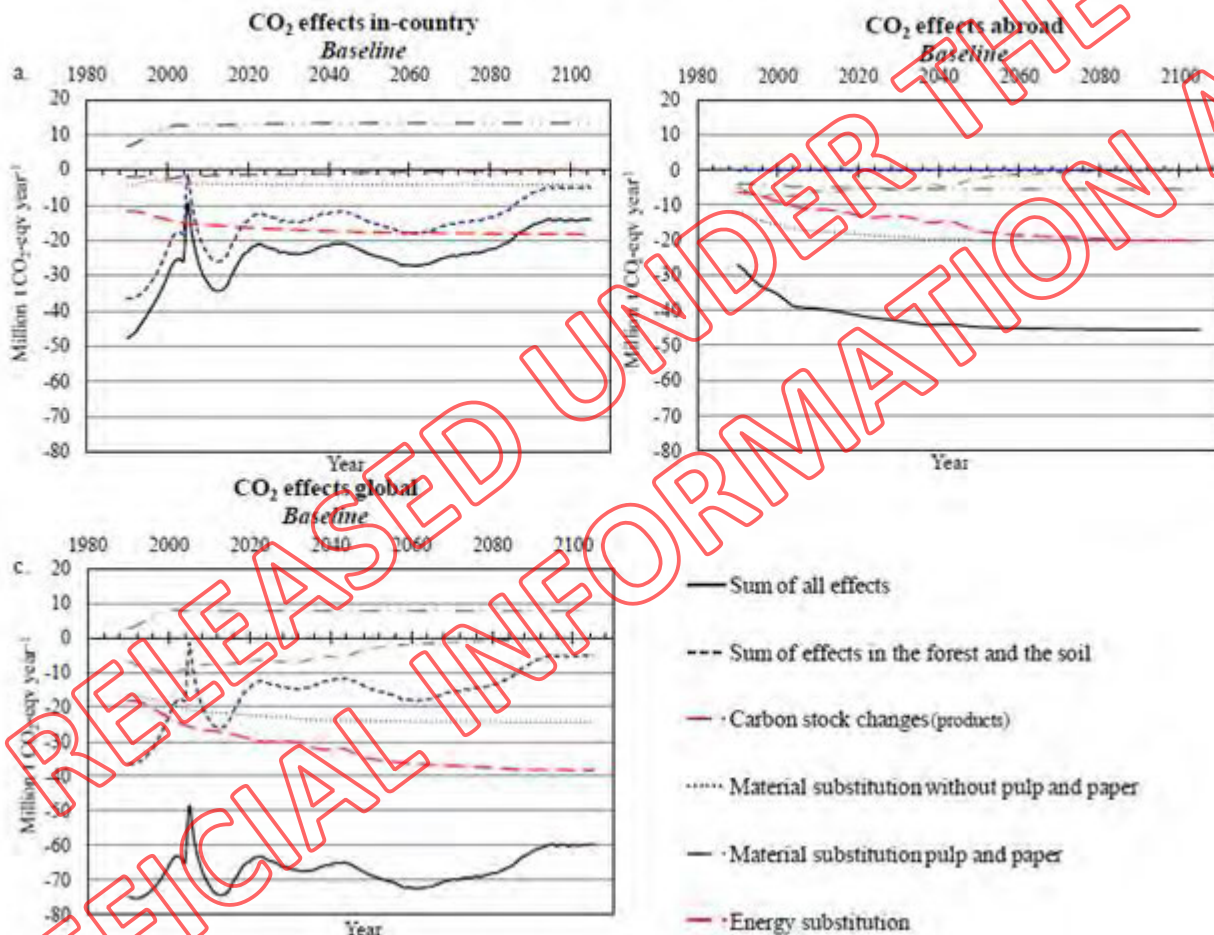
Tomas Lundmark ^{1,*}, Johan Bergh ², Peter Hofer ³, Anders Lundström ⁴, Annika Nordin ⁵, Bishnu Chandra Poudel ⁶, Roger Sathre ⁷, Ruedi Taverna ⁸ and Frank Werner

<https://www.mdpi.com/1999-4907/5/4/557>

Shows carbon removals from forests, HWP storage, and substitution effects (both domestic and abroad)

Interestingly they quantify wood product substitution effect as an emission (as it is not substituting any fossil fuel based production). If we consider this pattern in a NZ context, where most of the increase in timber is exported to china to make low quality wood products (ie cardboard boxes), we could view this as a missed opportunity to both increase the carbon stored in HWP, and to increase the substitution of more emissions intensive materials

Figure 3. The CO₂ reduction effect in the baseline scenario, in-country (a), abroad (b) and globally (c). due to Swedish forestry (the effects from all types of carbon stock changes are shown). Negative values represent reductions of atmospheric CO₂.



3. Quantitative estimation of carbon removal effects due to wood utilization up to 2050 in Japan: effects from carbon storage and substitution of fossil fuels by harvested wood products

Yuko Tsunetsugu · Mario Tonosaki

<https://link.springer.com/article/10.1007/s10086-009-1107-4>

Net removals from Carbon storage in HWP and substitution effects of HWP; baseline scenario of present HWP product mix (top) vs increasing HWP into long lived products for construction/furniture (bottom) (does not include carbon stored in forests)

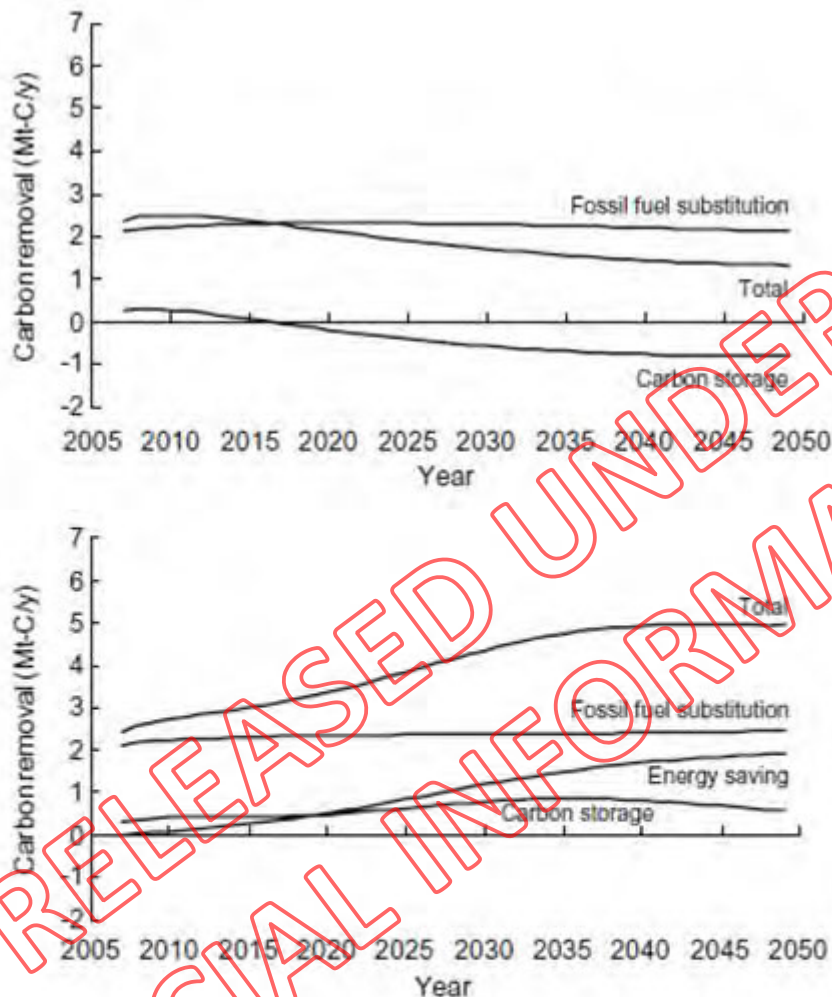


Fig. 4. Effects of carbon storage, energy saving, and fossil fuel substitution due to the utilization of harvested wood products in Japan. *Upper*, calculated results for the baseline scenario, where the percentage of wooden buildings in building starts and the percentage of wooden furniture in production remain at the 2005 level (35% for both). *Lower*, calculated results for the promotion scenario, where the percentage of wooden buildings/furniture increases sigmoidally to 70% by 2050

New Zealand context:

I'm not aware of any substantial research on the substitution effects from wood products in NZ (I believe the transition team are looking into this for the construction industry). This was highlighted as an area for future research in Wakelin et al. (2020) (<https://cbmjournals.biomedcentral.com/articles/10.1186/s13021-020-00144-5>).

Given that New Zealand forests can produce high volumes of timber very quickly (which can be used for longer lived products, such as sawn wood for construction), I would think there would be a high potential to have a higher stock

of carbon stored in HWP and to produce more wood products that can be used as a substitute for other emissions intensive materials/fuels, relative to other countries.

Some snippets from the Forest growers facts and figure document:

https://www.nzfoa.org.nz/images/Facts_and_Figures_2018-2019_Web.pdf

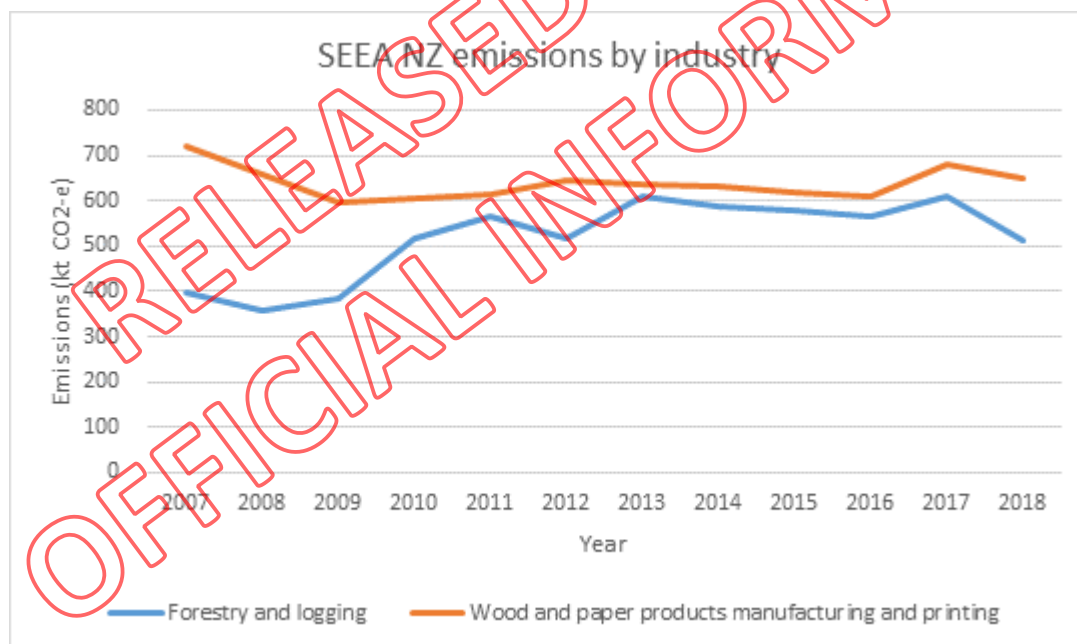
Wood is the only construction material which has absorbed CO₂ from the atmosphere when produced, not emitted more. During its production, one tonne of:

- Concrete – has released 159 kilos of CO₂ into the atmosphere
- Steel – has released 1.24 tonnes of CO₂ into the atmosphere
- Aluminium – has released 9.3 tonnes of CO₂ into the atmosphere
- Wood, however, has absorbed a net 1.7 tonnes of CO₂ from the atmosphere, over and above the energy expended in growing, harvesting and processing.

The more timber you use in a house, the more CO₂ you remove from the atmosphere

- It takes around 20 trees to build an average house frame
- A steel house frame has added 4.5 tonnes of CO₂ to the atmosphere
- A wooden house frame has absorbed 9.5 tonnes of CO₂ from the atmosphere

Although the general patterns are true, they look to be a little biased because there are some emissions associated with the extraction and production of these wood products in NZ:



Hope this is of use/interest.

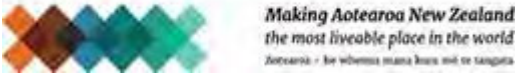
PS I'm still planning to get around to a bit of analysis and a write up on the potential carbon storage in HWP (both now and in the future), and how this might change over different scenarios of forest production and wood product mix (ie import vs export HWP pools). However, I've had my time taken up with this year's inventory run and Beef+Lamb report.

Will hopefully have something interesting to share when I get around to it.

Cheers,

s 9(2)(a)

Ministry for the Environment – Manatū Mō Te Taiao
s 9(2)(a) Website: www.mfe.govt.nz
23 Kate Sheppard Place, PO Box 10362, Wellington 6143



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Attachment "ffgc-03-00058.pdf" refused under s 18(d), as it is publicly available at:
www.frontiersin.org/articles/10.3389/ffgc.2020.00058/full

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From: s 9(2)(a)
To: [Redacted]
Cc: [Redacted]
Subject: CCC / MPI / MfE discussion on forest issues

Afternoon all,

For those of you coming tomorrow – we appreciate the time and expertise you're bringing

Some of you might not have the broader context that I've been discussing with us regarding forestry, and test our understanding of some of the underlying issues (see below) – particularly whether we should be bringing any specific issues to the surface

Look forward to the discussion

We'll be in person at the Commission We're at 1 Willis st (the AON building) Come to lifts A-D (on the Willis St side), press 21, and we'll see you up here

I've also added a Teams link if you can't make it in person (at bottom of this invite)

s 9(2)(a)

Hi s 9(2)(a)

Setting up a time to discuss forest issues with you and a few people from MfE This isn't to discuss official agency views, but to draw on your expertise to dig into these issues We're trying to land where our recs go, so that they are direction of policy with enough bite, but not into too much detail

If you think there are others who should attend, please forward to them

We'd like to cover:

- * The role of forestry in NZ's transition
- * Some key issues around:
 - * Afforestation of exotics and natives
 - * Increasing carbon stocks in existing forests exotics (p90 / beyond the average) natives
 - * Permanent post-89, what's the long-term outcome
 - * Sub-forest definition forests
 - * Use of timber – HWP and biofuels

How does this look to you? Any other issues that you think we should be considering?

Thanks,

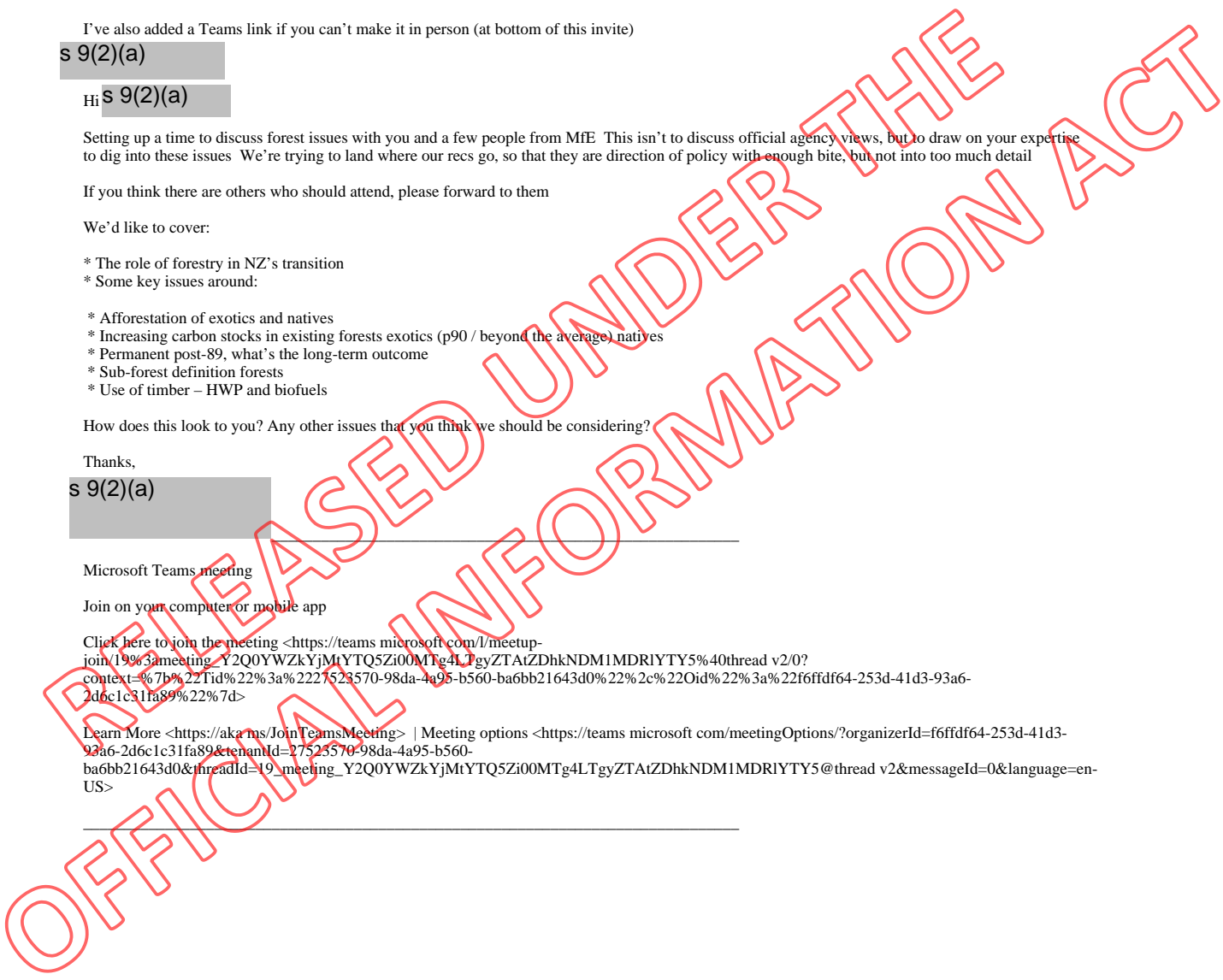
s 9(2)(a)

Microsoft Teams meeting

Join on your computer or mobile app

Click here to join the meeting <https://teams.microsoft.com/l/meetup-join/19%3ameeting_Y2Q0YWZkYjMtYTQ5Zi00MTg4LTgyZTAZDhkNDM1MDRIYTY5%40thread%20%22f6df64-253d-41d3-93a6-2d6c1c31fa89%22%7d>

Learn More <<https://aka.ms/JoinTeamsMeeting>> | Meeting options <https://teams.microsoft.com/meetingOptions/?organizerId=f6df64-253d-41d3-93a6-2d6c1c31fa89&tenantId=27523570-98da-4a95-b560-ba6bb21643d0&threadId=19_meeting_Y2Q0YWZkYjMtYTQ5Zi00MTg4LTgyZTAZDhkNDM1MDRIYTY5@thread%20%22f6df64-253d-41d3-93a6-2d6c1c31fa89%22%7d>&language=en-US>



From: s 9(2)(a)
To:
Subject: RE: Paul et al 2019 reference
Date: Thursday, 3 December 2020 9:49:20 am
Attachments: [image001.png](#)
[Carbon stocks and change in natural forests.pdf](#)

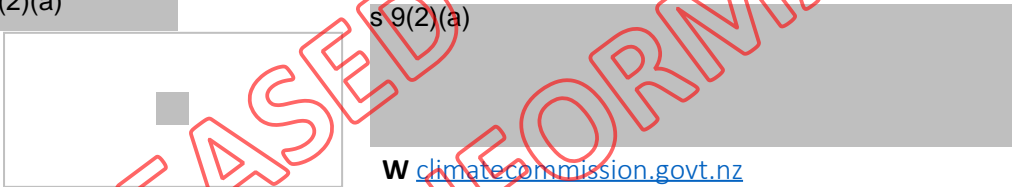
Hi s 9(2)(a)
Yes, here is the report 😊
Cheers,
s 9(2)(a)

From: s 9(2)(a) @climatecommission.govt.nz>
Sent: Wednesday, 2 December 2020 7:36 PM
To: s 9(2)(a) @mfe.govt.nz>
Subject: Paul et al 2019 reference
Hello s 9(2)(a)

Am addressing the comments received on chapter on Removals.
Could you share this document with us?

Paul TSH, Kimberley MO, Beets PN. Unpublished(b). Carbon Stocks and Change in New Zealand’s Natural Forests: Estimates from the First Two Complete Inventory Cycles 2002–2007 and 2007–2014. Contract report prepared for the Ministry for the Environment by the New Zealand Forest Research Institute Ltd (trading as Scion) in 2019.

Thank you,
s 9(2)(a)



W climatecommission.govt.nz

Check out s 9(2)(a) Transforming knowledge systems for life on Earth: Visions of future systems and how to get there <https://doi.org/10.1016/j.erss.2020.101724> (Open access)

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Attachment refused under s 18(d), as available at: <https://environment.govt.nz/publications/carbon-stocks-and-change-in-new-zealands-natural-forests/>

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s 9(2)(a)

From: s 9(2)(a) @mfe.govt.nz>
Sent: Friday, 12 February 2021 2:37 pm
To: s 9(2)(a)
Subject: RE: CCC advice question - 2018 emissions

Categories: LCANZ

Thanks all,

s 9(2)(a)

From: s 9(2)(a) @climatecommission.govt.nz>
Sent: Friday, 12 February 2021 2:36 PM
To: s 9(2)(a) @climatecommission.govt.nz>; s 9(2)(a) @climatecommission.govt.nz>; s 9(2)(a) @mfe.govt.nz>; s 9(2)(a) @gw.govt.nz>
Cc: s 9(2)(a) @gw.govt.nz>
Subject: RE: CCC advice question - 2018 emissions

Hi all,

Just to add – to save you reading numbers off charts – we’ve now published several datasets on our website page [here](#). Scroll down to the ‘Supplementary data and information’ section to find these.

Cheers,
s 9(2)(a)



s 9(2)(a)

www.climatecommission.govt.nz

From: s 9(2)(a) @climatecommission.govt.nz>
Sent: Friday, 12 February 2021 2:29 pm
To: s 9(2)(a) @climatecommission.govt.nz>; s 9(2)(a) @mfe.govt.nz>; s 9(2)(a) @gw.govt.nz>
Cc: s 9(2)(a) @gw.govt.nz>; s 9(2)(a) @climatecommission.govt.nz>
Subject: RE: CCC advice question - 2018 emissions

Hi everybody,

Briefly chatting to Paul about this. We think the difference is because we apply one accounting approach across time. It’s based on the NDC accounting, and you can find more detail of it in Chapter 3 of the Evidence Report.

<https://www.climatecommission.govt.nz/get-involved/our-advice-and-evidence/>

s 9(2)(a)
 So right, the key factor here is that we therefore use averaging for historic forest emissions as well as projected. So it will be different from both GHG Inventory and KP 2018 estimates. Figure 3.2 in the chapter above shows this compared to GHG Inventory accounting.

Cheers,

s 9(2)(a)

From: s 9(2)(a) <@climatecommission.govt.nz>
Sent: Rāmere, 12 Huitanguru, 2021 2:16 p.m.
To: s 9(2)(a) <@mfe.govt.nz>; s 9(2)(a) <@gw.govt.nz>
Cc: s 9(2)(a) <@gw.govt.nz>; s 9(2)(a) <@climatecommission.govt.nz>; s 9(2)(a) <@climatecommission.govt.nz>
Subject: Re: CCC advice question - 2018 emissions

s 9(2)(a) can provide the answer, but I think the difference is because this uses an approximation of the post 2020 accounting rules.

s 9(2)(a) - am I correct?

s 9(2)(a)

Climate Change Commission
 s 9(2)(a)

From: s 9(2)(a) <@mfe.govt.nz>
Sent: Friday, February 12, 2021 12:11
To: s 9(2)(a)
Cc: s 9(2)(a)
Subject: RE: CCC advice question - 2018 emissions

That is really strange,

s 9(2)(a) can you answer s 9(2)(a) question? Where did you get the 2018 forestry removals number from as it doesn't
 in our inventory.

Thanks,

s 9(2)(a)

From: s 9(2)(a) <@gw.govt.nz>
Sent: Friday, 12 February 2021 11:55 AM
To: s 9(2)(a) <@mfe.govt.nz>
Cc: s 9(2)(a) <@gw.govt.nz>
Subject: FW: CCC advice question - 2018 emissions

Hey s 9(2)(a)

Nice other day. Now we have a question you might be able to help with, see below, that figure for 2018 removals in the CCC report won't be the inventory #, but should be the KP accounting one – but I see it's reported in CH 11 as -15,447.0 for 2018 (<https://www.mfe.govt.nz/sites/default/files/media/Climate%20Change/new-zealands-greenhouse-gas-inventory-1990-2018-vol-1.pdf>)

Any thoughts on that?

s 9(2)(a) you've got the inventory number there rather than the one that's used for accounting, by applying KP forestry. But I would expect it to be 15.5 which it obviously isn't.

Appreciate any help you can give us s 9(2)(a)

Cheers

s 9(2)(a)

From: s 9(2)(a) @gw.govt.nz>
Sent: Friday, 12 February 2021 11:45 AM
To: s 9(2)(a) @gw.govt.nz>
Subject: CCC advice question - 2018 emissions

Hi s 9(2)(a)

Any thoughts on this? Who at MfE would be good to ask?

The graphs showing forestry emissions (removals) in 2018 in the CCC report have them in the range 9.5 to 10 MtCO2e (I haven't come across the figure in a table yet). See below.



Figure 2.3: Emissions of long-lived gases (left) and biogenic methane (right) by sector at the end of each budget period in our path, compared to 2018.

However, the national GHG accounts have this at 23.4 MtCO2e. see: <https://www.mfe.govt.nz/sites/default/files/media/Climate%20Change/new-zealands-greenhouse-gas-inventory-1990-2018-snapshot.pdf>

If this is explained somewhere in the advice, I haven't been able to locate it.

Thanks

s 9(2)(a)

Greater Wellington Regional Council

E: s 9(2)(a) @gw.govt.nz

M: s 9(2)(a)

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Out of Scope

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From: s 9(2)(a) <[redacted]@mfe.govt.nz>

Sent: Wednesday, 29 April 2020 1:49 PM

To: s 9(2)(a) <[redacted]@landcareresearch.co.nz>; s 9(2)(a) <[redacted]@mfe.govt.nz>; s 9(2)(a) <[redacted]@climatecommission.govt.nz>; s 9(2)(a) <[redacted]@landcareresearch.co.nz>; s 9(2)(a) <[redacted]@doc.govt.nz>; s 9(2)(a) <[redacted]@climatecommission.govt.nz>

Cc: s 9(2)(a) <[redacted]@mfe.govt.nz>

Subject: RE: Native forests and pests

Kia ora everyone,

I'd also like to say how great this meeting was last week. Was awesome to be part of such an important discussion.

Just let me know if I can be of help along the way (especially in regards to LUCAS natural forest

data).

Much thanks,

s 9(2)(a)

From: s 9(2)(a) <[redacted]@landcareresearch.co.nz>

Sent: Friday, 24 April 2020 5:54 PM

To: s 9(2)(a) <[redacted]@mfe.govt.nz>; s 9(2)(a) <[redacted]@climatecommission.govt.nz>; s 9(2)(a) <[redacted]@landcareresearch.co.nz>; s 9(2)(a) <[redacted]@doc.govt.nz>; s 9(2)(a) <[redacted]@climatecommission.govt.nz>

Cc: s 9(2)(a) <[redacted]@mfe.govt.nz>; s 9(2)(a) <[redacted]@mfe.govt.nz>

Subject: RE: Native forests and pests

MFE CYBER SECURITY WARNING

This email originated from outside our organisation. Please take extra care when clicking on any links or opening any attachments.

Kia ora koutou s 9(2)

First of all, thank you from (a) and I for inviting to us in to such an interesting discussion. Truly – it was a highlight of my week! I'm delighted to see this topic back on the agenda and I think there's lots of existing research, and some low hanging analysis fruits (mixing my metaphors there....) for addressing some of the questions raised today.

If possible, we'd be very keen to help with developing an agreed approach for applying corrections to plot-based data. We could build on past work with DOC, MfE and MPI around which corrections and assumptions to make, but also, we could explore the consequences of those decisions for the analyses (e.g. by running a range of data-correction scenarios to evaluate the impact on C sequestration rates, and the partitioning of those rates among growth, recruitment, and mortality). In the past we've discussed the idea with s 9(2)(a) team of having a small workshop with key analysts to compile and discuss all the data correction decisions that people make; then debating their validity; designing R scripts; and running scenarios to test the consequences of those choices. I think this would have value for all of us and it'd advance our understanding of whether (why, and where) forests have negative sequestration rates.

A second thought, perhaps for our next discussion on regenerating forests, is that we are currently scoping a project on secondary successions and a key theme is 'predicting predictability'. In other words, when can we be confident that secondary succession will occur (and how rapidly) and when does succession become unpredictable. This will build on all the work s 9(2)(a) ed back along, but it'd be valuable for me to learn more about your needs please, so we can share s 9(2)(a) at research to be maximally useful.

Many thanks again and best wishes to you all for the weekend.

Noho ora mai, na s 9(2)(a)

s 9(2)(a)

Manaaki Whenua – Landcare Research
PO Box 69040, Lincoln 7640, New Zealand

s 9(2)(a)

www.landcareresearch.co.nz

From: s 9(2)(a) <[redacted]@mfe.govt.nz>

Sent: Friday, 24 April 2020 4:00 PM

To: s 9(2)(a) <[redacted]@climatecommission.govt.nz>; s 9(2)(a) <[redacted]@landcareresearch.co.nz>; s 9(2)(a) <[redacted]@doc.govt.nz>; s 9(2)(a) <[redacted]@climatecommission.govt.nz>; s 9(2)(a) <[redacted]@landcareresearch.co.nz>

Cc: s 9(2)(a) <[redacted]@mfe.govt.nz>; s 9(2)(a) <[redacted]@mfe.govt.nz>

Subject: Native forests and pests

Hi all,

Thanks for the interesting discussions earlier today, it was really informative. I had two thoughts from the meeting that I thought I would follow up on while it's fresh.

Determining additionality from pest control

It was discussed earlier, and in the WACEM synthesis report, that proving additionality can be especially tricky, particularly in the vast area of pre-1990 forest. This is an important principal for emissions/removals of this nature to be included in accounting towards our international targets (KP, Paris).

However, I don't believe the approach for the **2050 net zero target** has been agreed upon yet? If it is going to follow the same or a similar ruleset to our target accounting (as used under KP or Paris), then yes the additionality from management (such as pest control) would need to be proven. However, if it is going to be a target of total net zero CO₂ emissions (as used in the UNFCCC reporting for the GHG inventory), then the additionality principal would not necessarily be needed for any carbon gains (or losses) to be included.

If certain pest management practices that help to increase or retain carbon stocks in certain forest types can be identified and then implemented, then we would expect Natural Forest Inventory to still pick these carbon gains up (even if we can't attribute the causal nature to be due to specific management practices or due to something else).

The rules around additionality for target accounting, are to encourage **additional** incentives that should help to drive a reduction in net emissions. However, that doesn't necessarily mean that if activities can't be proven to be driving additional and measurable carbon gains (ie certain management practices in forests, pest control ect.), that they should not be encouraged.

Because the area of pre-1990 natural forest is so big, even a small change in the average carbon stock change per hectare can result in a big difference in total emissions

Consistent methods for measuring and treating data in the NFI

Elaine – you pointed out how it would be a good idea to try and ensure methods for treating the plot /stem data were aligned across different agencies. I think this is a really good idea, especially as there have been some recent developments to how the data has been treated for LUCAS measures of carbon stock and stock change.

It will also be particularly important if there may be any further research (as new data becomes available) into how recruitment and mortality may influence carbon stocks and stock change (both now and in the long term).

We will be looking to plan the next stages of the analysis for the natural forest inventory over the next few months, which will also be looking to incorporate plots from half of the 3rd measurement period. It would be great to touch base with you again around this, to discuss how DoC also use the data and see if we can work towards an agreed set of methods and protocols for how this data should be treated and used.

Hope you all have a good long weekend J

Cheers,

s 9(2)(a)

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From: s 9(2)(a)
To: [Redacted]
Cc: [Redacted]
Subject: Afforestation
Date: Wednesday, 17 March 2021 1:15:29 pm
Attachments: [image001.png](#)
[Afforestation economic analysis.xlsx](#)

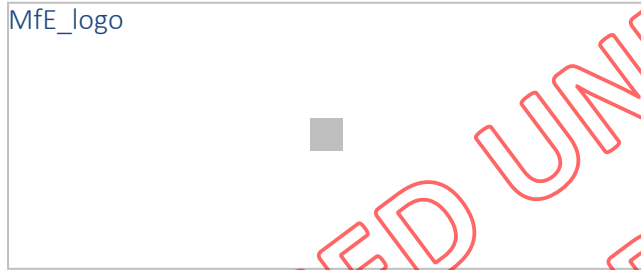
Hi both,
I understand from my discussion with (a) the other day that you are also thinking about the economics of afforestation? It may be d to align our assumptions around it. Hopefully you can make next Thursday.

I'd be interested in any input or feedback you have in the attached model.

Regards,

s 9(2)(a)
[Redacted]

Ministry for the Environment – Manatū Mō Te Taiao
s 9(2)(a) Website: www.mfe.govt.nz
23 Kate Sheppard Place, PO Box 10362, Wellington 6143



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Parameter inputs				Sensitivity analyses		
Metric	Source	Comment	Unit	low	Mid	High
Discount rate	Treasury	Treasury have moved from	%		7%	
Area of land			ha	100		
Macro multiplier	Treasury			1		
Native forest est costs	Aoteroa Circle report	Range is wide and site specific	\$/ha	\$1,000	\$3,500	\$13,750
Establishment costs exotic	Economic Impact of Forestry in NZ, Te Uru Rakau, 2020			\$1,500		
Sheep and beef opportunity	Socio-economic impacts of large-scale afforestation on rural communities			\$212		
Sheep and beef opportunity	Socio-economic impacts of large-scale afforestation on rural communities			5%		
Wairoa district forestry costs	Socio-economic impacts of large-scale afforestation on rural communities			\$7,050		
North Island hard hill costs	REINZ estimate for forestry land Sept 2020			\$7,800		
Harvest revenue	Economic Impact of Forestry in NZ, Te Uru Rakau, 2020			\$30,000		
Pest control /ha	Aoteroa Circle report			\$300		
Thinning /ha	Economic Impact of Forestry in NZ, Te Uru Rakau, 2021			\$1,000		
Rates, insurance /ha	Economic Impact of Forestry in NZ, Te Uru Rakau, 2021			\$50		
Averaging age				16		

References:

- https://beeflambnz.com/sites/default/files/Wairoa%20Afforestation_FINAL.pdf
- <https://www.nzfoa.org.nz/resources/file-libraries-resources/discussion-papers/848-economic-impacts-of-forestry-pwc-report/file>
- <https://www.pwc.co.nz/services/consulting/sustainability/the-aotearoa-circle-native-forests-report.pdf>

First thinning	Second thinning
7	11

Cost and abatement projection

Year	Costs exotic permanent		Costs exotic rotation		Costs native low		Costs native mid		Costs native high		Post-1989 exc			Post-1989 exotic			Post-1989 natural			Annual unit price						
	Unit	\$	\$	\$	\$	\$	tonnes CO2-e	tonnes CO2-e	tonnes CO2-e	tonnes CO2-e	tonnes CO2-e	tonnes CO2-e	tonnes CO2-e	tonnes CO2-e	tonnes CO2-e	tonnes CO2-e	tonnes CO2-e	tonnes CO2-e	tonnes CO2-e	\$50 by 2050	\$40 linear	Low price	CCC shadow			
1		150,000		150,000		100,000		350,000		1,375,000		-		-		-		-			40	40	20	40	2021	
2		\$5,000		\$5,000		\$35,000		\$35,000		\$35,000		92		92		454		454		454		41	40	20	53	2022
3		\$5,000		\$5,000		\$35,000		\$35,000		\$35,000		337		337		550		550		550		42	40	20	65	2023
4		\$5,000		\$5,000		\$35,000		\$35,000		\$35,000		385		385		640		640		640		43	40	20	78	2024
5		\$5,000		\$5,000		\$35,000		\$35,000		\$35,000		847		847		723		723		723		44	40	20	90	2025
6		\$5,000		\$5,000		\$35,000		\$35,000		\$35,000		1,844		1,844		800		800		800		46	40	20	103	2026
7		\$5,000		\$105,000		\$5,000		\$5,000		\$5,000		4,723		4,723		870		870		870		47	40	20	115	2027
8		\$5,000		\$5,000		\$5,000		\$5,000		\$5,000		5,691		5,691		934		934		934		48	40	20	128	2028
9		\$5,000		\$5,000		\$5,000		\$5,000		\$5,000		4,103		4,103		991		991		991		49	40	20	133	2029
10		\$5,000		\$5,000		\$5,000		\$5,000		\$5,000		3,828		3,828		1,042		1,042		1,042		50	40	20	140	2030
11		\$5,000		\$105,000		\$5,000		\$5,000		\$5,000		3,432		3,432		1,086		1,086		1,086		51	40	20	146	2031
12		\$5,000		\$5,000		\$5,000		\$5,000		\$5,000		3,249		3,249		1,124		1,124		1,124		52	40	20	151	2032
13		\$5,000		\$5,000		\$5,000		\$5,000		\$5,000		3,370		3,370		1,155		1,155		1,155		53	40	20	157	2033
14		\$5,000		\$5,000		\$5,000		\$5,000		\$5,000		3,601		3,601		1,180		1,180		1,180		54	40	20	162	2034
15		\$5,000		\$5,000		\$5,000		\$5,000		\$5,000		3,806		3,806		1,198		1,198		1,198		55	40	20	168	2035
16		\$5,000		\$5,000		\$5,000		\$5,000		\$5,000		3,923		3,923		1,210		1,210		1,210		57	40	20	173	2036
17		\$5,000		\$5,000		\$5,000		\$5,000		\$5,000		4,008		-		1,215		1,215		1,215		58	40	20	179	2037
18		\$5,000		\$5,000		\$5,000		\$5,000		\$5,000		4,085		-		1,213		1,213		1,213		59	40	20	184	2038
19		\$5,000		\$5,000		\$5,000		\$5,000		\$5,000		4,107		-		1,206		1,206		1,206		60	40	20	190	2039
20		\$5,000		\$5,000		\$5,000		\$5,000		\$5,000		4,088		-		1,191		1,191		1,191		61	40	20	195	2040
21		\$5,000		\$5,000		\$5,000		\$5,000		\$5,000		4,044		-		1,170		1,170		1,170		62	40	20	201	2041
22		\$5,000		\$5,000		\$5,000		\$5,000		\$5,000		4,011		-		1,143		1,143		1,143		63	40	20	206	2042
23		\$5,000		\$5,000		\$5,000		\$5,000		\$5,000		4,030		-		1,109		1,109		1,109		64	40	20	212	2043
24		\$5,000		\$5,000		\$5,000		\$5,000		\$5,000		4,088		-		1,069		1,069		1,069		65	40	20	217	2044
25		\$5,000		\$5,000		\$5,000		\$5,000		\$5,000		4,110		-		1,022		1,022		1,022		66	40	20	223	2045
26		\$5,000		\$5,000		\$5,000		\$5,000		\$5,000		4,110		-		968		968		968		68	40	20	228	2046
27		\$5,000		\$5,000		\$5,000		\$5,000		\$5,000		4,096		-		908		908		908		69	40	20	234	2047
28		\$5,000		\$5,000		\$5,000		\$5,000		\$5,000		4,063		3,000,000		842		842		842		70	40	20	239	2048
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4		\$5,000		\$5,000		\$5,000		\$5,000		\$5,000		3,901		-		604		604		604		74	40	20	261	2052
5		\$5,000		\$5,000		\$5,000		\$5,000		\$5,000		3,832		-		518		518		518		75	40	20	267	2053
6		\$5,000		\$5,000		\$5,000		\$5,000		\$5,000		3,758		-		481		481		481		76	40	20	272	2054
7		\$5,000		\$5,000		\$5,000		\$5,000		\$5,000		3,681		-		447		447		447		77	40	20	278	2055
8		\$5,000		\$5,000		\$5,000		\$5,000		\$5,000		3,608		-		417		417		417		79	40	20	283	2056
9		\$5,000		\$5,000		\$5,000		\$5,000		\$5,000		3,535		-		389		389		389		80	40	20	289	2057
10		\$5,000		\$5,000		\$5,000		\$5,000		\$5,000		3,458		-		364		364		364		81	40	20	294	2058
11		\$5,000		\$5,000		\$5,000		\$5,000		\$5,000		3,392		-		342		342		342		82	40	20	300	2059
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13	\$5,000	\$5,000	\$5,000	\$5,000	3,296	306	306	306	84	40	20	311	2061
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16	\$5,000	\$5,000	\$5,000	\$5,000	3,087	267	267	267	87	40	20	327	2064
17	\$5,000	\$5,000	\$5,000	\$5,000	3,003	258	258	258	88	40	20	333	2065
18	\$5,000	\$5,000	\$5,000	\$5,000	2,922	251	251	251	89	40	20	338	2066
19	\$5,000	\$5,000	\$5,000	\$5,000	2,842	245	245	245	91	40	20	344	2067
20	\$5,000	\$5,000	\$5,000	\$5,000	2,768	240	240	240	92	40	20	349	2068
21	\$5,000	\$5,000	\$5,000	\$5,000	2,695	236	236	236	93	40	20	355	2069
22	\$5,000	\$5,000	\$5,000	\$5,000	2,633	234	234	234	94	40	20	360	2070
23	\$5,000	\$5,000	\$5,000	\$5,000	2,567	232	232	232	95	40	20	366	2071
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26	\$5,000	\$5,000	\$5,000	\$5,000	2,398	230	230	230	98	40	20	382	2074
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		\$5,000	\$5,000	\$5,000		230	230	230	107	40	20	426	2082
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		\$5,000	\$5,000	\$5,000		230	230	230	132	40	20	553	2105
		\$5,000	\$5,000	\$5,000		230	230	230	134	40	20	558	2106
		\$5,000	\$5,000	\$5,000		230	230	230	135	40	20	564	2107
		\$5,000	\$5,000	\$5,000		230	230	230	136	40	20	569	2108
		\$5,000	\$5,000	\$5,000		230	230	230	137	40	20	575	2109
		\$5,000	\$5,000	\$5,000		230	230	230	138	40	20	580	2110
		\$5,000	\$5,000	\$5,000		230	230	230	139	40	20	586	2111
		\$5,000	\$5,000	\$5,000		230	230	230	140	40	20	591	2112
		\$5,000	\$5,000	\$5,000		230	230	230	141	40	20	597	2113
		\$5,000	\$5,000	\$5,000		230	230	230	142	40	20	602	2114
		\$5,000	\$5,000	\$5,000		230	230	230	143	40	20	608	2115
		\$5,000	\$5,000	\$5,000		230	230	230	145	40	20	613	2116
		\$5,000	\$5,000	\$5,000		230	230	230	146	40	20	619	2117
		\$5,000	\$5,000	\$5,000		230	230	230	147	40	20	624	2118
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		\$5,000	\$5,000	\$5,000		230	230	230	149	40	20	635	2120

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\$5,000	\$5,000	\$5,000	230	230	230	150	40	20	641	2121
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\$5,000	\$5,000	\$5,000	230	230	230	169	40	20	734	2138
\$5,000	\$5,000	\$5,000	230	230	230	170	40	20	740	2139
\$5,000	\$5,000	\$5,000	230	230	230	171	40	20	745	2140
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\$5,000	\$5,000	\$5,000	230	230	230	176	40	20	773	2145
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\$5,000	\$5,000	\$5,000	230	230	230	179	40	20	784	2147
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\$5,000	\$5,000	\$5,000	230	230	230	182	40	20	800	2150
\$5,000	\$5,000	\$5,000	230	230	230	183	40	20	806	2151
\$5,000	\$5,000	\$5,000	230	230	230	184	40	20	811	2152
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\$5,000	\$5,000	\$5,000	230	230	230	199	40	20	888	2166
\$5,000	\$5,000	\$5,000	230	230	230	201	40	20	894	2167
\$5,000	\$5,000	\$5,000	230	230	230	202	40	20	899	2168
\$5,000	\$5,000	\$5,000	230	230	230	203	40	20	905	2169
\$5,000	\$5,000	\$5,000	230	230	230	204	40	20	910	2170
\$5,000	\$5,000	\$5,000	230	230	230	205	40	20	916	2171

RELEASED UNDER THE OFFICIAL INFORMATION ACT

Macroeconomic simple CBA of afforestation

Scenario	No land purchase						With land purchase					
	Exotic permanent	Exotic averaging (w/)	Natural forest low cost	Natural forest mid cost	Natural forest high cost	(high planting cost from Aoteroa Circle)	Exotic permanent	Exotic averaging (v	Natural forest low cost	Natural forest mid cost	Natural forest high cost	
Establishment costs /ha	\$ 1,500	\$ 1,500	\$ 1,000	\$ 3,500	\$ 13,750		\$ 1,500	\$ 1,500	\$ 1,000	\$ 3,500	\$ 13,750	
Inputs												
Discount rate %	7%	7%	7%	7%	7%		7%	7%	3%	7%	7%	
Area ha	100	100	100	100	100		100	100	100	100	100	
Carbon price \$/t CO2-e	\$50 by 2050	\$50 by 2050	\$50 by 2050	\$50 by 2050	\$50 by 2050		\$50 by 2050	\$50 by 2050	\$50 by 2050	\$50 by 2050	\$50 by 2050	
Variable costs \$/ha												
Harvest revenue included Yes/no	Yes						Yes					
Grant \$/ha												
Macro multiplier (investment 1 or 1.5)	1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0	1.0	
Outputs												
Term (150 max)	50	28	50	50	50		28	28	50	50	50	
Costs \$m	\$ 0.2	\$ 0.3	\$ 0.3	\$ 0.5	\$ 1.6		\$ 1.1	\$ 1.1	\$ 1.1	\$ 1.3	\$ 2.3	
Benefits \$m	\$ 2.4	\$ 1.6	\$ 0.6	\$ 0.6	\$ 0.6		\$ 1.9	\$ 1.6	\$ 1.2	\$ 0.6	\$ 0.6	
Opportunity cost (NPV) \$m	\$ 0.4	\$ 0.3	\$ 0.4	\$ 0.4	\$ 0.4		(\$ 0.4)	(\$ 0.4)	(\$ 0.4)	(\$ 0.4)	(\$ 0.4)	
NPV (variable term) \$m	\$ 2.2	\$ 1.3	\$ 0.4	\$ 0.1	(\$ 0.9)		\$ 0.8	\$ 0.5	\$ 0.1	(\$ 0.7)	(\$ 1.7)	
CBR (variable term)	10.9	5.0	2.2	1.2	0.4		1.7	1.5	1.1	0.5	0.3	

Working

Discount factor											
2022	1.000	1.000	1.000	1.000	1.000		1.000	1.000	1.000	1.000	1.000
2023	0.935	0.935	0.935	0.935	0.935		0.935	0.935	0.971	0.935	0.935
2024	0.873	0.873	0.873	0.873	0.873		0.873	0.873	0.943	0.873	0.873
2025	0.816	0.816	0.816	0.816	0.816		0.816	0.816	0.915	0.816	0.816
2026	0.763	0.763	0.763	0.763	0.763		0.763	0.763	0.888	0.763	0.763
2027	0.713	0.713	0.713	0.713	0.713		0.713	0.713	0.863	0.713	0.713
2028	0.666	0.666	0.666	0.666	0.666		0.666	0.666	0.837	0.666	0.666
2029	0.623	0.623	0.623	0.623	0.623		0.623	0.623	0.813	0.623	0.623
2030	0.582	0.582	0.582	0.582	0.582		0.582	0.582	0.789	0.582	0.582
2031	0.544	0.544	0.544	0.544	0.544		0.544	0.544	0.766	0.544	0.544
2032	0.508	0.508	0.508	0.508	0.508		0.508	0.508	0.744	0.508	0.508
2033	0.475	0.475	0.475	0.475	0.475		0.475	0.475	0.722	0.475	0.475
2034	0.444	0.444	0.444	0.444	0.444		0.444	0.444	0.701	0.444	0.444
2035	0.415	0.415	0.415	0.415	0.415		0.415	0.415	0.681	0.415	0.415
2036	0.388	0.388	0.388	0.388	0.388		0.388	0.388	0.661	0.388	0.388
2037	0.362	0.362	0.362	0.362	0.362		0.362	0.362	0.642	0.362	0.362
2038	0.339	0.339	0.339	0.339	0.339		0.339	0.339	0.623	0.339	0.339
2039	0.317	0.317	0.317	0.317	0.317		0.317	0.317	0.605	0.317	0.317
2040	0.296	0.296	0.296	0.296	0.296		0.296	0.296	0.587	0.296	0.296
2041	0.277	0.277	0.277	0.277	0.277		0.277	0.277	0.570	0.277	0.277
2042	0.258	0.258	0.258	0.258	0.258		0.258	0.258	0.554	0.258	0.258
2043	0.242	0.242	0.242	0.242	0.242		0.242	0.242	0.538	0.242	0.242
2044	0.226	0.226	0.226	0.226	0.226		0.226	0.226	0.522	0.226	0.226
2045	0.211	0.211	0.211	0.211	0.211		0.211	0.211	0.507	0.211	0.211
2046	0.197	0.197	0.197	0.197	0.197		0.197	0.197	0.492	0.197	0.197
2047	0.184	0.184	0.184	0.184	0.184		0.184	0.184	0.478	0.184	0.184
2048	0.172	0.172	0.172	0.172	0.172		0.172	0.172	0.464	0.172	0.172
2049	0.161	0.161	0.161	0.161	0.161		0.161	0.161	0.450	0.161	0.161
2050	0.150	0.150	0.150	0.150	0.150		0.150	0.150	0.437	0.150	0.150
2051	0.141	0.141	0.141	0.141	0.141		0.141	0.141	0.424	0.141	0.141
2052	0.131	0.131	0.131	0.131	0.131		0.131	0.131	0.412	0.131	0.131
2053	0.123	0.123	0.123	0.123	0.123		0.123	0.123	0.400	0.123	0.123
2054	0.115	0.115	0.115	0.115	0.115		0.115	0.115	0.388	0.115	0.115
2055	0.107	0.107	0.107	0.107	0.107		0.107	0.107	0.377	0.107	0.107
2056	0.100	0.100	0.100	0.100	0.100		0.100	0.100	0.366	0.100	0.100
2057	0.094	0.094	0.094	0.094	0.094		0.094	0.094	0.355	0.094	0.094
2058	0.088	0.088	0.088	0.088	0.088		0.088	0.088	0.345	0.088	0.088
2059	0.082	0.082	0.082	0.082	0.082		0.082	0.082	0.335	0.082	0.082
2060	0.076	0.076	0.076	0.076	0.076		0.076	0.076	0.325	0.076	0.076
2061	0.071	0.071	0.071	0.071	0.071		0.071	0.071	0.316	0.071	0.071
2062	0.067	0.067	0.067	0.067	0.067		0.067	0.067	0.307	0.067	0.067
2063	0.062	0.062	0.062	0.062	0.062		0.062	0.062	0.298	0.062	0.062
2064	0.058	0.058	0.058	0.058	0.058		0.058	0.058	0.289	0.058	0.058

2065	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.281	0.055	0.055
2066	0.051	0.051	0.051	0.051	0.051	0.051	0.051	0.051	0.272	0.051	0.051
2067	0.048	0.048	0.048	0.048	0.048	0.048	0.048	0.048	0.264	0.048	0.048
2068	0.044	0.044	0.044	0.044	0.044	0.044	0.044	0.044	0.257	0.044	0.044
2069	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.249	0.042	0.042
2070	0.039	0.039	0.039	0.039	0.039	0.039	0.039	0.039	0.242	0.039	0.039
2071	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.235	0.036	0.036
2072	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.228	0.034	0.034
2073	0.032	0.032	0.032	0.032	0.032	0.032	0.032	0.032	0.221	0.032	0.032
2074	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.215	0.030	0.030
2075	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.209	0.028	0.028
2076	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.203	0.026	0.026
2077	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.197	0.024	0.024
2078	0.023	0.023	0.023	0.023	0.023	0.023	0.023	0.023	0.191	0.023	0.023
2079	0.021	0.021	0.021	0.021	0.021	0.021	0.021	0.021	0.185	0.021	0.021
2080	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.180	0.020	0.020
2081	0.018	0.018	0.018	0.018	0.018	0.018	0.018	0.018	0.175	0.018	0.018
2082	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.170	0.017	0.017
2083	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.165	0.016	0.016
2084	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.160	0.015	0.015
2085	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.155	0.014	0.014
2086	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.151	0.013	0.013
2087	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.146	0.012	0.012
2088	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.142	0.011	0.011
2089	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.138	0.011	0.011
2090	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.134	0.010	0.010
2091	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.130	0.009	0.009
2092	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.126	0.009	0.009
2093	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.123	0.008	0.008
2094	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.119	0.008	0.008
2095	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.116	0.007	0.007
2096	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.112	0.007	0.007
2097	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.109	0.006	0.006
2098	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.106	0.006	0.006
2099	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.103	0.005	0.005
2100	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.100	0.005	0.005
2101	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.097	0.005	0.005
2102	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.094	0.004	0.004
2103	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.091	0.004	0.004
2104	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.089	0.004	0.004
2105	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.086	0.004	0.004
2106	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.083	0.003	0.003
2107	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.081	0.003	0.003
2108	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.079	0.003	0.003
2109	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.076	0.003	0.003
2110	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.074	0.003	0.003
2111	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.072	0.002	0.002
2112	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.070	0.002	0.002
2113	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.068	0.002	0.002
2114	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.066	0.002	0.002
2115	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.064	0.002	0.002
2116	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.062	0.002	0.002
2117	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.060	0.002	0.002
2118	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.059	0.002	0.002
2119	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.057	0.001	0.001
2120	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.055	0.001	0.001
2121	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.054	0.001	0.001
2122	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.052	0.001	0.001
2123	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.051	0.001	0.001
2124	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.049	0.001	0.001
2125	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.048	0.001	0.001
2126	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.046	0.001	0.001
2127	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.045	0.001	0.001
2128	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.044	0.001	0.001
2129	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.042	0.001	0.001

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2108	\$	5,000	\$	5,000	\$	5,000
2109	\$	5,000	\$	5,000	\$	5,000
2110	\$	5,000	\$	5,000	\$	5,000
2111	\$	5,000	\$	5,000	\$	5,000
2112	\$	5,000	\$	5,000	\$	5,000
2113	\$	5,000	\$	5,000	\$	5,000
2114	\$	5,000	\$	5,000	\$	5,000
2115	\$	5,000	\$	5,000	\$	5,000
2116	\$	5,000	\$	5,000	\$	5,000
2117	\$	5,000	\$	5,000	\$	5,000
2118	\$	5,000	\$	5,000	\$	5,000
2119	\$	5,000	\$	5,000	\$	5,000
2120	\$	5,000	\$	5,000	\$	5,000
2121	\$	5,000	\$	5,000	\$	5,000
2122	\$	5,000	\$	5,000	\$	5,000
2123	\$	5,000	\$	5,000	\$	5,000
2124	\$	5,000	\$	5,000	\$	5,000
2125	\$	5,000	\$	5,000	\$	5,000
2126	\$	5,000	\$	5,000	\$	5,000
2127	\$	5,000	\$	5,000	\$	5,000
2128	\$	5,000	\$	5,000	\$	5,000
2129	\$	5,000	\$	5,000	\$	5,000
2130	\$	5,000	\$	5,000	\$	5,000
2131	\$	5,000	\$	5,000	\$	5,000
2132	\$	5,000	\$	5,000	\$	5,000
2133	\$	5,000	\$	5,000	\$	5,000
2134	\$	5,000	\$	5,000	\$	5,000
2135	\$	5,000	\$	5,000	\$	5,000
2136	\$	5,000	\$	5,000	\$	5,000
2137	\$	5,000	\$	5,000	\$	5,000
2138	\$	5,000	\$	5,000	\$	5,000
2139	\$	5,000	\$	5,000	\$	5,000
2140	\$	5,000	\$	5,000	\$	5,000
2141	\$	5,000	\$	5,000	\$	5,000
2142	\$	5,000	\$	5,000	\$	5,000
2143	\$	5,000	\$	5,000	\$	5,000
2144	\$	5,000	\$	5,000	\$	5,000
2145	\$	5,000	\$	5,000	\$	5,000
2146	\$	5,000	\$	5,000	\$	5,000
2147	\$	5,000	\$	5,000	\$	5,000
2148	\$	5,000	\$	5,000	\$	5,000
2149	\$	5,000	\$	5,000	\$	5,000
2150	\$	5,000	\$	5,000	\$	5,000
2151	\$	5,000	\$	5,000	\$	5,000
2152	\$	5,000	\$	5,000	\$	5,000
2153	\$	5,000	\$	5,000	\$	5,000
2154	\$	5,000	\$	5,000	\$	5,000
2155	\$	5,000	\$	5,000	\$	5,000
2156	\$	5,000	\$	5,000	\$	5,000
2157	\$	5,000	\$	5,000	\$	5,000
2158	\$	5,000	\$	5,000	\$	5,000
2159	\$	5,000	\$	5,000	\$	5,000
2160	\$	5,000	\$	5,000	\$	5,000
2161	\$	5,000	\$	5,000	\$	5,000
2162	\$	5,000	\$	5,000	\$	5,000
2163	\$	5,000	\$	5,000	\$	5,000
2164	\$	5,000	\$	5,000	\$	5,000
2165	\$	5,000	\$	5,000	\$	5,000
2166	\$	5,000	\$	5,000	\$	5,000
2167	\$	5,000	\$	5,000	\$	5,000
2168	\$	5,000	\$	5,000	\$	5,000
2169	\$	5,000	\$	5,000	\$	5,000
2170	\$	5,000	\$	5,000	\$	5,000
2171	\$	5,000	\$	5,000	\$	5,000

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Benefits

2022	\$	-	\$	-	\$	-	\$	-	\$	-	\$	-	\$	-	\$	
2023	\$	3,768	\$	3,768	\$	18,643	\$	18,643	\$	18,643	\$	3,768	\$	3,768	\$	18,643
2024	\$	14,235	\$	14,235	\$	23,206	\$	23,206	\$	23,206	\$	14,235	\$	14,235	\$	23,206
2025	\$	16,671	\$	16,671	\$	27,700	\$	27,700	\$	27,700	\$	16,671	\$	16,671	\$	27,700
2026	\$	37,607	\$	37,607	\$	32,102	\$	32,102	\$	32,102	\$	37,607	\$	37,607	\$	32,102
2027	\$	83,917	\$	83,917	\$	36,391	\$	36,391	\$	36,391	\$	83,917	\$	83,917	\$	36,391
2028	\$	220,076	\$	220,076	\$	40,546	\$	40,546	\$	40,546	\$	220,076	\$	220,076	\$	40,546
2029	\$	271,445	\$	271,445	\$	44,545	\$	44,545	\$	44,545	\$	271,445	\$	271,445	\$	44,545
2030	\$	200,226	\$	200,226	\$	48,366	\$	48,366	\$	48,366	\$	200,226	\$	200,226	\$	48,366
2031	\$	191,017	\$	191,017	\$	51,989	\$	51,989	\$	51,989	\$	191,017	\$	191,017	\$	51,989
2032	\$	175,032	\$	175,032	\$	55,391	\$	55,391	\$	55,391	\$	175,032	\$	175,032	\$	55,391
2033	\$	169,256	\$	169,256	\$	58,551	\$	58,551	\$	58,551	\$	169,256	\$	169,256	\$	58,551
2034	\$	179,266	\$	179,266	\$	61,448	\$	61,448	\$	61,448	\$	179,266	\$	179,266	\$	61,448
2035	\$	195,516	\$	195,516	\$	64,060	\$	64,060	\$	64,060	\$	195,516	\$	195,516	\$	64,060
2036	\$	210,852	\$	210,852	\$	66,366	\$	66,366	\$	66,366	\$	210,852	\$	210,852	\$	66,366
2037	\$	221,668	\$	221,668	\$	68,344	\$	68,344	\$	68,344	\$	221,668	\$	221,668	\$	68,344
2038	\$	230,842	\$	-	\$	69,972	\$	69,972	\$	69,972	\$	230,842	\$	-	\$	69,972
2039	\$	239,770	\$	-	\$	71,230	\$	71,230	\$	71,230	\$	239,770	\$	-	\$	71,230
2040	\$	245,579	\$	-	\$	72,096	\$	72,096	\$	72,096	\$	245,579	\$	-	\$	72,096
2041	\$	248,980	\$	-	\$	72,548	\$	72,548	\$	72,548	\$	248,980	\$	-	\$	72,548
2042	\$	250,749	\$	-	\$	72,564	\$	72,564	\$	72,564	\$	250,749	\$	-	\$	72,564
2043	\$	253,115	\$	-	\$	72,124	\$	72,124	\$	72,124	\$	253,115	\$	-	\$	72,124
2044	\$	258,705	\$	-	\$	71,206	\$	71,206	\$	71,206	\$	258,705	\$	-	\$	71,206
2045	\$	266,968	\$	-	\$	69,788	\$	69,788	\$	69,788	\$	266,968	\$	-	\$	69,788
2046	\$	272,926	\$	-	\$	67,849	\$	67,849	\$	67,849	\$	272,926	\$	-	\$	67,849
2047	\$	277,448	\$	-	\$	65,368	\$	65,368	\$	65,368	\$	277,448	\$	-	\$	65,368
2048	\$	280,963	\$	-	\$	62,322	\$	62,322	\$	62,322	\$	280,963	\$	-	\$	62,322
2049	\$	283,168	\$	3,000,000	\$	58,691	\$	58,691	\$	58,691	\$	283,168	\$	3,000,000	\$	58,691
2050	\$	286,339	\$	-	\$	54,452	\$	54,452	\$	54,452	\$	286,339	\$	-	\$	54,452
2051	\$	288,942	\$	-	\$	49,585	\$	49,585	\$	49,585	\$	288,942	\$	-	\$	49,585
2052	\$	289,615	\$	-	\$	44,068	\$	44,068	\$	44,068	\$	289,615	\$	-	\$	44,068
2053	\$	289,089	\$	-	\$	44,732	\$	44,732	\$	44,732	\$	289,089	\$	-	\$	44,732
2054	\$	288,141	\$	-	\$	38,932	\$	38,932	\$	38,932	\$	288,141	\$	-	\$	38,932
2055	\$	286,761	\$	-	\$	36,679	\$	36,679	\$	36,679	\$	286,761	\$	-	\$	36,679
2056	\$	284,935	\$	-	\$	34,601	\$	34,601	\$	34,601	\$	284,935	\$	-	\$	34,601
2057	\$	283,228	\$	-	\$	32,696	\$	32,696	\$	32,696	\$	283,228	\$	-	\$	32,696
2058	\$	281,359	\$	-	\$	30,962	\$	30,962	\$	30,962	\$	281,359	\$	-	\$	30,962
2059	\$	279,034	\$	-	\$	29,398	\$	29,398	\$	29,398	\$	279,034	\$	-	\$	29,398
2060	\$	277,438	\$	-	\$	27,999	\$	27,999	\$	27,999	\$	277,438	\$	-	\$	27,999
2061	\$	276,002	\$	-	\$	26,763	\$	26,763	\$	26,763	\$	276,002	\$	-	\$	26,763
2062	\$	276,892	\$	-	\$	25,684	\$	25,684	\$	25,684	\$	276,892	\$	-	\$	25,684
2063	\$	278,022	\$	-	\$	24,756	\$	24,756	\$	24,756	\$	278,022	\$	-	\$	24,756
2064	\$	273,714	\$	-	\$	23,976	\$	23,976	\$	23,976	\$	273,714	\$	-	\$	23,976
2065	\$	269,524	\$	-	\$	23,334	\$	23,334	\$	23,334	\$	269,524	\$	-	\$	23,334
2066	\$	265,465	\$	-	\$	22,825	\$	22,825	\$	22,825	\$	265,465	\$	-	\$	22,825
2067	\$	261,549	\$	-	\$	22,441	\$	22,441	\$	22,441	\$	261,549	\$	-	\$	22,441
2068	\$	257,455	\$	-	\$	22,172	\$	22,172	\$	22,172	\$	257,455	\$	-	\$	22,172
2069	\$	253,856	\$	-	\$	22,010	\$	22,010	\$	22,010	\$	253,856	\$	-	\$	22,010
2070	\$	250,096	\$	-	\$	21,944	\$	21,944	\$	21,944	\$	250,096	\$	-	\$	21,944
2071	\$	247,207	\$	-	\$	21,965	\$	21,965	\$	21,965	\$	247,207	\$	-	\$	21,965
2072	\$	243,833	\$	-	\$	22,059	\$	22,059	\$	22,059	\$	243,833	\$	-	\$	22,059
2073	\$	241,371	\$	-	\$	22,058	\$	22,058	\$	22,058	\$	241,371	\$	-	\$	22,058
2074	\$	238,432	\$	-	\$	22,311	\$	22,311	\$	22,311	\$	238,432	\$	-	\$	22,311
2075	\$	235,723	\$	-	\$	22,563	\$	22,563	\$	22,563	\$	235,723	\$	-	\$	22,563
2076	\$	233,988	\$	-	\$	22,816	\$	22,816	\$	22,816	\$	233,988	\$	-	\$	22,816
2077	\$	231,786	\$	3,000,000	\$	23,068	\$	23,068	\$	23,068	\$	231,786	\$	3,000,000	\$	23,068
2078	\$	230,226	\$	-	\$	23,321	\$	23,321	\$	23,321	\$	230,226	\$	-	\$	23,321
2079	\$	228,199	\$	-	\$	23,573	\$	23,573	\$	23,573	\$	228,199	\$	-	\$	23,573
2080	\$	227,218	\$	-	\$	23,826	\$	23,826	\$	23,826	\$	227,218	\$	-	\$	23,826
2081			\$		\$	24,078	\$	24,078	\$	24,078	\$		\$		\$	24,078
2082			\$		\$	24,331	\$	24,331	\$	24,331	\$		\$		\$	24,331
2083			\$		\$	24,583	\$	24,583	\$	24,583	\$		\$		\$	24,583
2084			\$		\$	24,836	\$	24,836	\$	24,836	\$		\$		\$	24,836

2085	\$	25,088	\$	25,088	\$	25,088	\$	25,088	\$	25,088
2086	\$	25,340	\$	25,340	\$	25,340	\$	25,340	\$	25,340
2087	\$	25,593	\$	25,593	\$	25,593	\$	25,593	\$	25,593
2088	\$	25,845	\$	25,845	\$	25,845	\$	25,845	\$	25,845
2089	\$	26,098	\$	26,098	\$	26,098	\$	26,098	\$	26,098
2090	\$	26,350	\$	26,350	\$	26,350	\$	26,350	\$	26,350
2091	\$	26,603	\$	26,603	\$	26,603	\$	26,603	\$	26,603
2092	\$	26,855	\$	26,855	\$	26,855	\$	26,855	\$	26,855
2093	\$	27,108	\$	27,108	\$	27,108	\$	27,108	\$	27,108
2094	\$	27,360	\$	27,360	\$	27,360	\$	27,360	\$	27,360
2095	\$	27,613	\$	27,613	\$	27,613	\$	27,613	\$	27,613
2096	\$	27,865	\$	27,865	\$	27,865	\$	27,865	\$	27,865
2097	\$	28,118	\$	28,118	\$	28,118	\$	28,118	\$	28,118
2098	\$	28,370	\$	28,370	\$	28,370	\$	28,370	\$	28,370
2099	\$	28,623	\$	28,623	\$	28,623	\$	28,623	\$	28,623
2100	\$	28,875	\$	28,875	\$	28,875	\$	28,875	\$	28,875
2101	\$	29,128	\$	29,128	\$	29,128	\$	29,128	\$	29,128
2102	\$	29,380	\$	29,380	\$	29,380	\$	29,380	\$	29,380
2103	\$	29,633	\$	29,633	\$	29,633	\$	29,633	\$	29,633
2104	\$	29,885	\$	29,885	\$	29,885	\$	29,885	\$	29,885
2105	\$	30,138	\$	30,138	\$	30,138	\$	30,138	\$	30,138
2106	\$	30,390	\$	30,390	\$	30,390	\$	30,390	\$	30,390
2107	\$	30,643	\$	30,643	\$	30,643	\$	30,643	\$	30,643
2108	\$	30,895	\$	30,895	\$	30,895	\$	30,895	\$	30,895
2109	\$	31,148	\$	31,148	\$	31,148	\$	31,148	\$	31,148
2110	\$	31,400	\$	31,400	\$	31,400	\$	31,400	\$	31,400
2111	\$	31,653	\$	31,653	\$	31,653	\$	31,653	\$	31,653
2112	\$	31,905	\$	31,905	\$	31,905	\$	31,905	\$	31,905
2113	\$	32,158	\$	32,158	\$	32,158	\$	32,158	\$	32,158
2114	\$	32,410	\$	32,410	\$	32,410	\$	32,410	\$	32,410
2115	\$	32,663	\$	32,663	\$	32,663	\$	32,663	\$	32,663
2116	\$	32,915	\$	32,915	\$	32,915	\$	32,915	\$	32,915
2117	\$	33,168	\$	33,168	\$	33,168	\$	33,168	\$	33,168
2118	\$	33,420	\$	33,420	\$	33,420	\$	33,420	\$	33,420
2119	\$	33,673	\$	33,673	\$	33,673	\$	33,673	\$	33,673
2120	\$	33,925	\$	33,925	\$	33,925	\$	33,925	\$	33,925
2121	\$	34,178	\$	34,178	\$	34,178	\$	34,178	\$	34,178
2122	\$	34,430	\$	34,430	\$	34,430	\$	34,430	\$	34,430
2123	\$	34,682	\$	34,682	\$	34,682	\$	34,682	\$	34,682
2124	\$	34,935	\$	34,935	\$	34,935	\$	34,935	\$	34,935
2125	\$	35,187	\$	35,187	\$	35,187	\$	35,187	\$	35,187
2126	\$	35,440	\$	35,440	\$	35,440	\$	35,440	\$	35,440
2127	\$	35,692	\$	35,692	\$	35,692	\$	35,692	\$	35,692
2128	\$	35,945	\$	35,945	\$	35,945	\$	35,945	\$	35,945
2129	\$	36,197	\$	36,197	\$	36,197	\$	36,197	\$	36,197
2130	\$	36,450	\$	36,450	\$	36,450	\$	36,450	\$	36,450
2131	\$	36,702	\$	36,702	\$	36,702	\$	36,702	\$	36,702
2132	\$	36,955	\$	36,955	\$	36,955	\$	36,955	\$	36,955
2133	\$	37,207	\$	37,207	\$	37,207	\$	37,207	\$	37,207
2134	\$	37,460	\$	37,460	\$	37,460	\$	37,460	\$	37,460
2135	\$	37,712	\$	37,712	\$	37,712	\$	37,712	\$	37,712
2136	\$	37,965	\$	37,965	\$	37,965	\$	37,965	\$	37,965
2137	\$	38,217	\$	38,217	\$	38,217	\$	38,217	\$	38,217
2138	\$	38,470	\$	38,470	\$	38,470	\$	38,470	\$	38,470
2139	\$	38,722	\$	38,722	\$	38,722	\$	38,722	\$	38,722
2140	\$	38,975	\$	38,975	\$	38,975	\$	38,975	\$	38,975
2141	\$	39,227	\$	39,227	\$	39,227	\$	39,227	\$	39,227
2142	\$	39,480	\$	39,480	\$	39,480	\$	39,480	\$	39,480
2143	\$	39,732	\$	39,732	\$	39,732	\$	39,732	\$	39,732
2144	\$	39,985	\$	39,985	\$	39,985	\$	39,985	\$	39,985
2145	\$	40,237	\$	40,237	\$	40,237	\$	40,237	\$	40,237
2146	\$	40,490	\$	40,490	\$	40,490	\$	40,490	\$	40,490
2147	\$	40,742	\$	40,742	\$	40,742	\$	40,742	\$	40,742
2148	\$	40,995	\$	40,995	\$	40,995	\$	40,995	\$	40,995
2149	\$	41,247	\$	41,247	\$	41,247	\$	41,247	\$	41,247

2150	\$	41,500	\$	41,500	\$	41,500	\$	41,500	\$	41,500
2151	\$	41,752	\$	41,752	\$	41,752	\$	41,752	\$	41,752
2152	\$	42,005	\$	42,005	\$	42,005	\$	42,005	\$	42,005
2153	\$	42,257	\$	42,257	\$	42,257	\$	42,257	\$	42,257
2154	\$	42,510	\$	42,510	\$	42,510	\$	42,510	\$	42,510
2155	\$	42,762	\$	42,762	\$	42,762	\$	42,762	\$	42,762
2156	\$	43,015	\$	43,015	\$	43,015	\$	43,015	\$	43,015
2157	\$	43,267	\$	43,267	\$	43,267	\$	43,267	\$	43,267
2158	\$	43,520	\$	43,520	\$	43,520	\$	43,520	\$	43,520
2159	\$	43,772	\$	43,772	\$	43,772	\$	43,772	\$	43,772
2160	\$	44,024	\$	44,024	\$	44,024	\$	44,024	\$	44,024
2161	\$	44,277	\$	44,277	\$	44,277	\$	44,277	\$	44,277
2162	\$	44,529	\$	44,529	\$	44,529	\$	44,529	\$	44,529
2163	\$	44,782	\$	44,782	\$	44,782	\$	44,782	\$	44,782
2164	\$	45,034	\$	45,034	\$	45,034	\$	45,034	\$	45,034
2165	\$	45,287	\$	45,287	\$	45,287	\$	45,287	\$	45,287
2166	\$	45,539	\$	45,539	\$	45,539	\$	45,539	\$	45,539
2167	\$	45,792	\$	45,792	\$	45,792	\$	45,792	\$	45,792
2168	\$	46,044	\$	46,044	\$	46,044	\$	46,044	\$	46,044
2169	\$	46,297	\$	46,297	\$	46,297	\$	46,297	\$	46,297
2170	\$	46,549	\$	46,549	\$	46,549	\$	46,549	\$	46,549
2171	\$	46,802	\$	46,802	\$	46,802	\$	46,802	\$	46,802

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From: s 9(2)(a)
To: [Redacted]
Cc: [Redacted]
Subject: RE: Afforestation
Date: Thursday, 25 March 2021 12:40:00 pm
Attachments: [DRAFT Assumptions CCC Natives ComplementaryAnalysis.xlsx](#)
[image001.png](#)

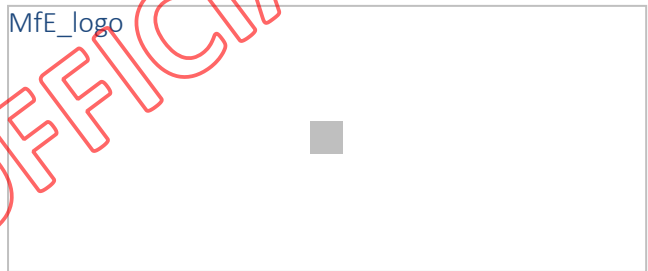
Thank you so much s 9(2)(a)
Please find attached [Redacted] mptions and costs of different alternatives I've explored (cashflow only, not CBA).
Most of them come from published sources and the highest ones (e.g. Project Crimson) are from email trails.
None of them include land or regulation compliance costs.
Looking forward to our chat later today.
Cheers,
s 9(2)(a)

From: s 9(2)(a) [Redacted]@mfe.govt.nz>
Sent: Wednesday, 17 March 2021 1:15 pm
To: s 9(2)(a) [Redacted]@climatecommission.govt.nz>; s 9(2)(a) [Redacted]@climatecommission.govt.nz>
Cc: s 9(2)(a) [Redacted]@mfe.govt.nz>; s 9(2)(a) [Redacted]@mfe.govt.nz>
Subject: Afforestation

Hi both,
I understand from my discussion with (a) s 9(2) the other day that you are also thinking about the economics of afforestation? It may be good to align our assumptions around it. Hopefully you can make next Thursday.
I'd be interested in any input or feedback you have in the attached model.

Regards,
s 9(2)(a) [Redacted]

Ministry for the Environment – Manatū Mō Te Taiao
s 9(2)(a) [Redacted] Website: www.mfe.govt.nz
23 Kate Sheppard Place, PO Box 10362, Wellington 6143



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Summary establishment cost of explored alternatives

	NZD
Alternative 1: Planting for amenity values, weed and pest control, NO fencing	-7085
1a Project Crimson	-20,000
1b Project Crimson	-40,000
Alternative 2: Planting for amenity values, weed and pest control, with fencing	-8183
Alternative 3: Reversion for amenity values, weed and pest control, with fencing	-1283
Alternative 4: Reversion for amenity values, weed and pest control, with fencing, with enrichment planting	-1783
Alternative 5: Planting for timber (Rimu, harvest at 80 & 120 years), no fencing, average [flat & steep], Continuous forest cover, 20% harvest	-4186
Alternative 6: Mixed: amenity + honey	-7088
Alternative 7: Mixed Timber native [Rimu] + honey	-4189
Alternative 8: Planting for timber (Pine), no fencing - Average East Coast [flat+steep] (Pizzirani et al 2019)	-1631

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s 9(2)(a)

From: s 9(2)(a) @mfe.govt.nz>
Sent: Tuesday, 22 June 2021 9:53 am
To: s 9(2)(a)
Cc:
Subject: RE: pre-1990 natural deforestation

Categories: LCANZ

Hi s 9(2)(a)

West Coast features strongly between 2013 and 2016 (which is our last available mapping) with approximately half of all the tall natural forest deforestation happening in that region.

Deforestation of regenerating shrubland in the Pre-1990 Natural Forest class is a bit more evenly spread, with Hawkes Bay leading the pack with about one quarter of the total over that period.

Ngā mihi

s 9(2)(a)

From: s 9(2)(a) @climatecommission.govt.nz>
Sent: Tuesday, 22 June 2021 9:18 am
To: s 9(2)(a) @mfe.govt.nz>
Subject: pre-1990 natural deforestation

Hi s 9(2)(a)

How are you?

Would you be able to help us out by giving us an idea of where pre-1990 natural deforestation is occurring? We've got a media query after our advice was published and we'd like to get some more information.

We've got the total figures from Table 6.1.6 in the Inventory report, but nothing more granular.

Thanks,

s 9(2)(a)



s 9(2)(a)

W climatecommission.govt.nz

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