



COMMENTS BY
WILDLIFE CONSERVATION SOCIETY CANADA
ON
YUKON TERRITORIAL GOVERNMENT'S DOCUMENT
"OUR CLEAN FUTURE: A YUKON STRATEGY FOR CLIMATE CHANGE, ENERGY AND A GREEN ECONOMY"

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This set of Comments has been put together for the public review
of the draft *Our Clean Future* document (November 2019)
by Whitehorse-based scientists:

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Introduction

We provide the following set of comments based on the invitation for public input on the Yukon Territorial Government's draft strategy (*Our Clean Future*, November 2019) for dealing with the climate crisis and associated issues around energy and a green economy. We thank the Government for this opportunity to provide input on what is likely to be a pivotal document and process in Yukon's future.

WCS Wildlife Conservation Society Canada is a non-profit, charitable organization working at a national scale in Canada. Our mission is to save wildlife and wild places through science, conservation action, and inspiring people to value nature. WCS Canada scientists have been working in Yukon since 2004 on land use and protected areas planning, land and water management, and wildlife conservation research and policy applications. Our role is to provide long-term site-based research and syntheses of science that inform policy and practice and support the implementation of effective conservation measures by providing technical advice and by engaging relevant decision-makers at all levels, from local to federal. We are interested in renewable energy because the capture of energy from any source will result in some environmental effects including impacts on fish and wildlife and their habitats, and because dealing with the climate crisis is particularly required to stem loss of biodiversity. An understanding of these effects and impacts has to be brought into decision-making.

We have organized our comments following the structure of the *Our Clean Future* (November 2019) document, so the headings used here correspond to those in the document being reviewed. Our specific recommendations are underlined.

About the Draft Strategy

Review period: We are encouraged to read that the strategy will be reviewed every three to four years. This is certainly necessary for a set of Actions aimed at addressing the "climate crisis" and that must achieve results to help meet Canada's global commitments to reduction of carbon emissions.

We are concerned that there is no specific mention of how the Government will report Yukon's carbon emissions to the public in Yukon. These have to be reported to the federal government on an annual basis so that the country can report its emissions to the international community as per the Paris Agreement. Yukoners need to be able to learn about and assess our annual emissions and progress towards the stated goal in this strategy: 30% reduction below 2010 levels by 2030. We recommend that this strategy include specific mention of the need for annual reporting to Yukoners on carbon emissions, and lay out the details of which government agency(ies) has the responsibility for the accounting, and the full set of categories of emissions sources for which independent quantitative data are and will be gathered.

Our Future

The aspirational and optimistic text in this section is good and needed to inspire action on what is indeed a crisis situation. Rightly so, it includes various words that can have positive connotations in the context of climate solutions— renewable, green, and clean. However, these terms are not defined.

Consequently they leave open considerable room for misinterpretation. One very real misinterpretation is that they are synonymous; that what is “renewable” is necessarily “clean”, for example. That is not the case, and so some misinterpretations turn up later in the document (as we will illustrate). We recommend that this section define these terms (clean, green, and renewable) at least in a footnote.

Values

The set of Values laid out here is certainly positive and uplifting, and they can contribute to a sense of purpose and hope, which is good.

We note that in some circumstances particular Values could become contradictory. For example, the Value “Make Informed Decisions” is fluid and changeable in that we currently lack all the information to make the best decisions about whether and how to implement certain Actions. So, as new information becomes available, it might challenge our ability to satisfy other Values such as Respect Our Natural Environment or No “one size fits all” Approach.

Decision makers will need to assert specific Values in precedence or preference to other Values in certain circumstances. This will be challenging, as there is no indication in this strategy as to where the priorities in Values lie. In the context of an overheating climate we propose two policy priorities that should drive a prioritization of Values. These are: (i) evidenced-based analysis of how best to reduce carbon emissions and/or capture carbon from the atmosphere, since these are the dominant biophysical actions that have to occur in dealing with the climate crisis, coupled with (ii) evidenced-based analysis of how to minimize the environmental costs of implementing programs and actions to reduce carbon emissions and capture carbon. These policy priorities fit best under the Value – Respect Our Natural Environment. Consequently we recommend that Respect Our Natural Environment be recognized in this section as the paramount Value, and that fact should be evident in the Goals of this strategy (next section).

Respect for our environment is at the heart of the climate crisis. An historical lack of respect has led us into the crisis, and threatens our future. At the same time, most Actions we propose to deal with the crisis will have some environmental impact. There is no such thing as a free ride for any organism in nature over the long term, humans included, especially given our massive global population. Consequently we have a major set of trade-offs to contemplate as we move to shift our sources of energy to reduce carbon emissions, thereby building new economic activities. How best can we reduce emissions and capture carbon without at the same time incurring large new environmental costs?

Indigenous elders and others repeatedly assert that “respect for nature and animals” is a central practice and philosophical cornerstone of their worldview. This gives added impetus to make Respect for Our Natural Environment the core Value of this strategy.

The Value “Be Accountable” is important, and states that “the final strategy will include information about timelines, evaluation and costs”. This is crucial, because a weakness of this draft is a lack of evidence that government is going to take the lead in making the Actions measurable and readily evaluated, with timelines, targets, and costing. We recommend that a substantial stand-alone section of

the final strategy should include a set of timelines, milestones or targets for evaluation, and cost estimates.

Costing is crucial for this Value. We are dealing with a crisis situation, wherein government needs to start re-allocating costs from other purposes, such as highway upgrades, to dealing with the climate crisis which has to be among the highest priorities in our spending. We recommend that territorial government spending on this strategy be itemized in its own section of the annual Territorial Budget, not buried in separate Departmental budgets where the actual investments and efforts are difficult to assess.

Goals

The draft strategy lays out 4 Goals. Each one has merit, but not equal merit. As presented there is no explicit recognition of priority among Goals, other than the order in which they are presented. That order reflects what we think the prioritization should be. However, the Goals, as with the Values above, might be contradictory in some circumstances or in some interpretations of the language. For example, the second Goal (“Ensure Yukoners have access to affordable, reliable and renewable energy”) could be in conflict with the first Goal (“Reduce Yukon’s greenhouse gas emissions”) depending on how the terms “affordable” and “renewable” are defined and interpreted. For example, biomass energy may be affordable and renewable, satisfying Goal 2, but will add to Yukon’s greenhouse gas emissions, so be in direct contradiction to Goal 1 (detailed analysis in sections below). So, decision makers will be faced with potentially contradictory directives. We recommend that the strategy explicitly lay out the prioritization among Goals. We also repeat our recommendation about the need to define some of words whose meanings are plastic (see *Our Future* above).

Reducing greenhouse gas emissions (Goal 1)

This section lays out the problems quite clearly (but see our Recommendation under ***Building a Green Economy*** below) and sets a useful context.

The pivotal target in this section and the entire strategy is the reduction of emissions to 30% below 2010 values by 2030. However, no justification is provided for target amount, target date, and baseline date. The public needs to understand where these figures came from, and why the strategy is using them. We recommend that the strategy provide explicit justification that the target of reducing emissions to 30% below 2010 values by 2030 is the most suitable and justifiable for Yukon in the current crisis.

We see the need for some additional information to be presented in this section. First, the text lacks the full context of the emissions reduction scenario under the Paris Agreement, which is the need to reach no net carbon emissions by 2050. This draft strategy only lays out a target for 2030. A relatively short-term target (e.g., by 2030) is necessary for a massive undertaking such as this strategy, and needs to be in the Strategy to provide solid direction for the immediate implementation of Actions. However, it is only the first step in a series of steps we have to go through. Those other steps (notably the 2050 target), and the magnitude of the problem in achieving them, are crucial to a public understanding of what needs to be done and to an evaluation of alternative Actions even within the next decade to 2030.

We must not rein in our ambition to just the 2030 target if opportunities to exceed that target by 2030 are in front of us; in fact the 2050 target shows that we should embrace a more ambitious schedule. Figure 4, which is located much later in the document, pertains directly to this point, and should be brought forward in the document. We recommend that the text include the longer term context of targets under the Paris Agreement, and a visual graphic of the total extent of carbon emission reductions that we need to achieve to reach the Paris Agreement target (e.g., a modification to current Figure 4).

Second, there is no mention in this draft strategy of the way in which Government will report carbon emissions to Yukoners during the implementation of the Actions. Yukoners deserve to know all the categories and subcategories of emissions, as reported by the Territory to the federal government, and their quantities, on an annual basis. The general graphics and text presented here (e.g., Figure 2) are useful for this strategy, but are inadequate for a citizen or organization to have a substantive understanding of where alternative Actions might have an effect. For example, it is not possible to understand what sets of emissions from diverse sources are included in the Heating or Road Transportation roll-ups in the data presented. We recommend that this strategy include specific mention of the need for annual reporting to Yukoners on carbon emissions, and lay out the details of which government agency(ies) has the responsibility for the accounting, and the full set of categories of emissions sources for which independent quantitative data are gathered.

Additional action on mining

This section of the strategy states that the mining sector will get special treatment, and that their emissions will not even be quantitatively included in the annual reporting of emissions. Instead the Government will work to agree on intensity-based targets for the mining sector.

This approach is disingenuous because it will hide emissions from this sector in our territorial and national reporting, provide a false picture of what we are actually achieving, and could well cause us to fail in reaching even the 2030 target. All sectors of society have to play their part in this crisis. The mining sector is no different.

The text argues in favour of the intensity-based approach in two ways. First, it states that the mining sector should get easy treatment because it produces metals of high value for the emerging “global green economy”. As a statement of fact, this is only true to a certain extent. A substantial portion of the mineral output from Yukon is gold which has only marginal value to emerging technologies. It does not follow that the entire mining sector should get special treatment.

As a statement of policy, this is yet another subsidy for the mining industry at a time when all sectors of the economy and society have to be contributing, and when commodity prices already gauge the need for a mining industry in Yukon to contribute to the green economy. Many economic enterprises and individual citizens outside the mining sector are contributing materially to solutions for the climate crisis through their own investments and foregone opportunities. The market place through commodity price returns on demand will provide the incentives for development of mineral deposits that are required in the emerging economy. Another subsidy to the mining industry is neither fair nor needed.

Second, it states that: “If mining were incorporated into Yukon’s overall greenhouse gas reduction target, there is a risk that a decrease in mining activity could cause us to reach our target, resulting in less motivation to reduce greenhouse gas emissions from transportation, heating and other key areas.” This is an embarrassing rationalization rather than a solid reason for treating the mineral industry any differently. It points out why this document has to put the bigger climate change picture to 2050 in the text (as recommended above). Reaching our 2030 target before 2030 has no risk associated with it. In fact that would be a major positive accomplishment, because the journey to reach the 2050 target is going to be a huge challenge. The Government should be searching for ways in which to exceed the 2030 target by 2030. Also there should be no risk to the 2030 target not being met in other sectors because the planning and prioritization around the Actions and their associated policy initiatives should aim to meet the 2030 target in each and every one of the sectors independently.

We recommend that the mining sector be treated as every other sector with a goal of reducing total emissions by 30% below 2010 levels by 2030.

We also recommend that this document provide quantitative data on the mining sector’s carbon emissions since at least 2010 so that Yukoners can judge the relative contribution of that sector to the problem and understand the scale of the problem when mining is not included in the projected picture of emissions.

Ensuring reliable, affordable and renewable energy (Goal 2)

This section lays out the need for increased availability of electricity as an energy source. It correctly states the need for new sources of electricity to be developed in the territory, but fails to adequately stress just how important this is. A lack of serious investment in this direction over the past decade has put us way behind where we should already be given how long this problem has been on the table. The tentative nature of Government’s approach to this problem is reflected in this text: “We **may** also need to upgrade electricity transmission and distribution infrastructure to support increased use of electricity for things like electric vehicle charging.” There should be no doubt about this need; it is imperative. We recommend that the strategy put much more emphasis on this section, asserting its central importance in emissions reductions, and specifying that the massive need for infrastructure investments and incentives should be one of the top priorities in Government spending, far above what Governments frequently put as high priority such as highway upgrading and new buildings.

Under Transportation and Heating, the stated target is to reach 40% of heating needs from renewable sources by 2030. It also explicitly states that biomass energy will be pursued as one of those renewable energy sources. The latter statement is a huge mistake. Biomass may be renewable, but it is not clean or green because it produces high levels of carbon emissions. More reliance on biomass energy will produce a net annual increase in our carbon emissions from the heating sector, which will then work completely counter to Goal 1 which is to reduce emissions from each sector.

We recommend that biomass energy be removed from this document as a suitable replacement source of energy for space heating. Our more detailed reasoning follows.

The carbon budget of burning biomass for energy: Biomass energy is created by burning organic materials that have quite recently been alive. In Yukon, these are mainly wood products from trees. When burned, the carbon that makes up much of the wood goes directly into the atmosphere. Also, there are additional carbon emissions from the harvest, transportation, and processing of the wood.

The effect of this burning on the carbon budget depends on the time and spatial scales of accounting. When all of the carbon dioxide released from burning can be absorbed by new growth of plants *at the same sites in the same annual cycle*¹, there is no net contribution to the atmospheric carbon pool from the burning (i.e., the energy source is carbon neutral). Carbon neutrality can only be achieved when just one year's worth of growth is burnt in the annual cycle (i.e., carbon payback time of one year).

Carbon neutrality is not achieved, however, when the biomass fuel stock has many years and often decades of carbon accumulation through growth. Such is the case with burning whole trees (whether green or already dead), or wood residue and slash, as we do in Yukon. New plant growth, on sites where the fuel trees previously grew, cannot absorb all of the many years and often decades of tree growth in one annual cycle. The net effect is a large contribution of carbon dioxide to the atmosphere annually, creating a "carbon debt" that has to be recovered in the future², with carbon payback time of many years and even many decades³. This is in direct contradiction to the major policy imperative to reduce such carbon emissions year by year.

The fate of carbon dioxide from burnt wood should be compared to the fate of that same carbon if the wood were not burnt. If left on the land, dead wood slowly decomposes releasing carbon dioxide. Burning that dead wood to produce power or heat accelerates the release of carbon dioxide compared to decomposition⁴.

The amount of carbon dioxide emitted by burning wood also needs to be compared to that from other fuel sources. Burning wood produces greater carbon emissions than coal or natural gas for the same amount of energy produced⁵. Depending on the wood type and combustion process, burning wood can produce higher carbon emissions per unit energy obtained than some fossil fuels⁶.

Policy direction towards biomass globally and in Yukon: Jurisdictions as large as the European Union and the USA have historically promoted biomass energy as carbon neutral⁷. Policy initiatives here in Yukon such as the Biomass Energy Strategy (2016) and the draft Whitehorse and Southern Lakes Forest Resources Management Plan (2019) have also made this assertion. In the *Our Clean Future* document, biomass is now labelled as "low-carbon".

¹ An annual accounting period should be applied to biomass as this is the accounting period applied to all other forms of human activity that create carbon emissions, such as burning of fossil fuels and raising livestock. New growth of plants "at the same sites" is required because carbon absorption at all other sites is already maximized given that the atmospheric carbon pool keeps increasing.

² Fargione et al. 2008. *Science* 319:1235-1238.

³ Birdsey et al. 2018 *Environmental Research Letters* 13:050201. <https://doi.org/10.1088/1748-9326/aab9d5>

⁴ Dymond et al. 2010. *Forest Ecology and Management* 260: 181-192.

⁵ Birdsey et al. 2018. *Op. cit.*

⁶ Mäkipää, R. et al. 2015. *Canadian Journal of Forest Research* 45: 217–225 [dx.doi.org/10.1139/cjfr-2014-0120](https://doi.org/10.1139/cjfr-2014-0120)

⁷ For example: <https://www.scientificamerican.com/article/congress-says-biomass-is-carbon-neutral-but-scientists-disagree/>

The notion that burning biomass for energy is carbon neutral or low-carbon is increasingly challenged by scientists and policy makers⁸. The Scientific Advisory Board to the U.S. Environmental Protection Agency stated in March 2019 that emissions created by burning recently living wood stocks cannot be assumed to be carbon neutral and have substantial net carbon emissions⁹. The Science Advisory Council of the European Academies warned the European Commission in 2017 and 2018¹⁰ that burning wood harvested from forests cannot be considered carbon neutral for the purposes of meeting carbon emissions targets because of substantive net carbon emissions, and therefore the emissions from biomass must be built into the accounting of carbon footprints. Those warnings also stated that classifying biomass energy as carbon neutral (i.e. discounted in carbon accounting) was actually inducing major increases in conversion of the carbon in mature forests to carbon dioxide in the atmosphere at a time when exactly the reverse is required (see also¹¹).

Although not promoted as carbon neutral in *Our Clean Future*, the label of “low-carbon” implies that the carbon footprint of burning wood is inconsequential. However, the waste wood, and live and dead trees that we burn in biomass installations and individual homes require years if not decades to grow back. The carbon debt happens in the current year; the carbon payback is many years and often decades into the future, varying with factors such as decay rates of dead wood left on site¹². Year by year our wood burning continues to produce more carbon to the atmosphere than can be absorbed. Burning biomass goes directly against our need to balance our carbon accounting as quickly as possible by getting rid of major sources of emissions.

Consequently, we recommend that the policy direction put forward by Yukon Government of investing in new biomass energy infrastructure¹³ be dropped from the government’s priorities, and that the equivalent financial and other resources be directed towards development of energy from renewables that are more aptly described as “low-carbon”.

WCS Canada also notes that burning biomass for energy creates considerable additional environmental impacts. We point out negative health impacts under the Actions for Homes and Buildings, below. Also, salvaging of fire- or beetle-killed wood can have negative impacts on biodiversity¹⁴, a subject WCS

⁸ Booth. 2018. Environmental Research Letters 13. <https://doi.org/10.1088/1748-9326/aaac88> and

<https://www.euractiv.com/section/energy/opinion/need-for-a-scientific-basis-of-eu-climate-policy-on-forests/>

⁹ [https://yosemite.epa.gov/sab/sabproduct.nsf/0/B86C81BACFAF9735852583B4005B3318/\\$File/EPA-SAB-19-002+.pdf](https://yosemite.epa.gov/sab/sabproduct.nsf/0/B86C81BACFAF9735852583B4005B3318/$File/EPA-SAB-19-002+.pdf)

¹⁰ EASAC 2017. Multi-functionality and sustainability in the European Union’s forests.

https://easac.eu/fileadmin/PDF_s/reports_statements/Forests/EASAC_Forests_web_complete.pdf and in 2018

https://easac.eu/fileadmin/user_upload/180108_Letter_to_President_Juncker.pdf

¹¹ Kirschbaum 2003. Biomass and Bioenergy 24: 297-310.

¹² Mansuy, N. et al. 2018. Salvage harvesting for bioenergy in Canada: From sustainable and integrated supply chain to climate change mitigation. WIREs Energy Environ. 2018;7:e298.

<https://doi.org/10.1002/wene.298>

¹³ Yukon Government 2019. “Our Clean Future”, and Renewable Energy and Energy Efficiency Update (2016-2018) <http://www.energy.gov.yk.ca/pdf/emr-energy-strategy-update-2016-2018.pdf>

¹⁴ Cooke, H. et al. 2019. Fire and Insects: Managing naturally disturbed forests to conserve ecological values.

Conservation Series Report No. 12, Wildlife Conservation Society Canada, Toronto, ON.

<https://www.wcscanada.org/Portals/96/Documents/Reports%20and%20publications/SalvageLogging-highres.pdf>

Canada scientists have investigated in depth. Industrial-scale salvage logging for dead wood in Yukon to fuel a growing biomass industry would make these risks higher.

Burning wood for space heating is well established in Yukon, and will continue to contribute to our energy supply and annual carbon emissions for some years. We argue that these emissions from biomass should be included in the Yukon Government's reporting of annual emissions; they cannot be ignored or left out of the emissions accounts as being "low-carbon" or "carbon neutral".

However, biomass is best viewed as a "bridging" form of energy supply, to be phased out as we progress to truly cleaner sources of energy¹⁵. New investments in capacity and infrastructure to burn biomass are short-sighted at this time of climate crisis because they lock our economy into a mode of energy supply that is not "clean" and will have to be replaced to reach 2050 targets. To hasten a phasing out of wood burning, incentives are needed to make electric or geothermal energy economically more favourable sources of heat than burning wood: that needs to be at the heart of the Government strategy towards a Clean Future.

Adapting to climate change (Goal 3)

The text in this section is quite detailed and well represents the issues at hand.

Building a green economy (Goal 4)

The climate crisis is providing new economic opportunities, and new economic ventures are successfully emerging. This is a good thing especially when these ventures contribute to the achievement of Goal 1 in particular.

There is a danger that any potential business venture that can somehow achieve the labels renewable, clean, or green will automatically be fast-tracked for support under this Goal. That should not be the case. Biomass energy is a case in point. It uses a renewable resource, but it is not clean or green in the sense of satisfying Goal 1 – the reduction of emissions.

All new economic activity will have some environmental impact. This means that impacts have to be adequately assessed before the economic activity takes hold (Is it truly "clean"?). It also means that this Goal has to be approached with great care to avoid the commonly repeated fault that a new economic activity or technology is successful in the market place but creates detrimental environmental and social side-effects and economic externalities. When Government itself is the proponent of the new economic sector or technology, then the onus is on Government to adequately assess the economic, environmental and social impacts of what it is proposing.

The market place is inadequate as an arbiter of social good, especially environmental good. The climate crisis is itself a prime example: carbon pollution is a side effect of burning carbon-rich fuels without an up-front recognition of the ultimate environmental cost which is overheating of the atmosphere. Historically, those costs have been externalized from economic analysis and now the global future is at

¹⁵ Project Drawdown. <https://www.drawdown.org/solutions/electricity-generation/biomass>

risk. Society is belatedly beginning to internalize those costs in the price of carbon-rich fuels, in particular through a carbon tax. That policy is not even mentioned in this entire strategy. Yet it is a pivotal part of getting all sectors of society to shift away from carbon-rich fuels. Disincentives to burning hydrocarbons, such as the federal government's tax on carbon in fuels, are essential and need to be stronger than at present. We recommend that the strategy include a section (probably under *Reducing greenhouse gas emissions* above) in which the climate crisis is explained in terms of the failure of the market place to internalize the full costs of burning carbon, the need for disincentives to burning carbon-rich fuels is explained, and a carbon tax (truer cost accounting for carbon pollution) is promoted as a necessary policy which needs increasing emphasis.

Taking Action

Generally speaking, the text and information presented in this section is good and sufficient.

Measuring our Progress

The development of plans and measures of progress will be essential and is welcomed here.

Reaching our Targets

Figure 4 illustrates the shortcomings of not including the long term projections to 2050 for reaching the Paris Agreement targets (see our Recommendation above under *Reducing Greenhouse Gas Emissions (Goal 1)*). The substantial GHG emission reductions by 2030 are actually small compared to what has to be achieved by 2050 (zero net emissions). We recommend that Figure 4 be placed earlier in the document (under *Reducing our Greenhouse Gas Emissions*) and modified to include the carbon emissions trajectory to 2050.

The caption to Figure 4 is confusing. It does not explain the large fluctuations in Historical emissions, which we suspect are because of variations in mining activity. However, it describes the emissions as being "non-mining". Does that description refer to the entire emissions trajectory in the graph? We recommend that the information presented in this graph be better explained in the caption.

The exclusion of mining emissions from Figure 4 (at least in future projections) illustrates that the emissions reduction targets in this strategy are not ambitious enough, and the removal of mining emissions is obscuring our view of the scale of the problem and what needs to be done. We recommend that some of the Anticipated Greenhouse Gas Reductions listed here be more ambitious (e.g., more electric vehicles; higher proportion of community energy from electricity), and that this strategy be much more transparent with data on what the mining sector emissions have been historically.

This section includes an emissions reduction target labelled: Conducting energy efficiency retrofits and installing renewable heating systems in Government of Yukon buildings. In general this is a valuable target, but will not help in emissions reductions if biomass is included as "renewable", as we argue above. We recommend that the retrofitting of Yukon Government buildings with "renewable" heating systems should not include biomass systems. These may be renewable, but will not substantively

decrease carbon emissions and will lock the Territory into a long-term pattern of high carbon emissions from those sources.

Actions sector by sector

Generally speaking the lists of Actions proposed are good and well conceived, and illustrate serious attention to the question of “solutions” to the climate crisis. The major exceptions are the area of Biomass Energy which we have addressed above and do so again here to some extent, and the inadequate attention to the value of intact landscapes in carbon accounting (below under *Communities*).

Transportation

Actions #16 and #20 (and also #58 in a subsequent section) reference “clean” fuel sources, such as ethanol and biodiesel. These are hydrocarbons with high carbon emissions, so what is meant by “clean”? We understand that these biofuels may produce less emissions per volume burned than conventional fossil fuels (so might assist the achievement of some targets in the short term), but what is the basis for labelling them as “clean” in a full life-cycle analysis. For example, this strategy also refers to energy sources such as geothermal, solar, and wind as “clean”. Do biofuels really fit in the same “clean” category as geothermal, wind, and solar in terms of carbon emission per unit energy produced in a full life-cycle analysis (including land clearing, harvesting, processing and transportation)? We recommend that the document provide a definition of “clean” (in this specific context, which might be different than how the word is used elsewhere in the strategy for other fuel sources), a justification for putting biofuels in the same category as geothermal, solar and wind, and references to the science that supports the claim of lowered emissions from these fuels in a full life-cycle analysis.

Homes and Buildings

This section repeatedly asserts (e.g., Actions 47 through 52) that biomass energy should be used as a new system for heating buildings because it is low-carbon and renewable. In our reading of the science and the logic of the carbon cycle, biomass is not a low-carbon source of energy, and should not be viewed as a clean source of energy in this context. We detail the reasoning under *Ensuring reliable, affordable and renewable energy* above.

In addition, the list of Actions in this section includes #51 (Conduct a lifecycle analysis of biomass energy use in Yukon to identify recommended forest management practices to guide sustainable and low-carbon biomass harvesting). The inclusion of this Action suggests that the promotion of biomass energy is premature because this lifecycle analysis has not been done. It should have been done in a strategic environmental assessment of this technology in the climate change context before Governments latched onto this technology with the main purpose of creating economic activity. We have reviewed the science of this problem in some detail¹⁶ and concluded that burning wood is not a low-carbon

¹⁶ Cooke, H. et al. 2019. Fire and Insects: Managing naturally disturbed forests to conserve ecological values. Conservation Series Report No. 12, Wildlife Conservation Society Canada, Toronto, ON.
<https://www.wcscanada.org/Portals/96/Documents/Reports%20and%20publications/SalvageLogging-highres.pdf>

source of energy (see under *Ensuring reliable, affordable and renewable energy* above). We recommend that all initiatives to promote biomass energy be put on hold until this Action is completed.

Action # 50 (Regulate air emissions from biomass burning systems to minimize the release of harmful air pollutants) illustrates the problem of externalities or side-effects of the promotion of certain technologies in the so-called green or clean economy. Biomass energy produces significant emissions of volatile organic compounds and particulates which are already a health hazard in Whitehorse¹⁷. This problem is recognized again in Actions #102 and #103. These recognitions of a health problem lend additional evidence to the argument that biomass energy is not clean or green.

Action # 52 (Continue to use residual biomass fibre harvested during forest fuel management projects to provide a source of renewable biomass energy and increase the resilience of communities to wildland fire risk) seems to provide an argument in favour of biomass energy installations because there have been and will be certain volumes of “waste” wood (branches, slash, small trees and shrubs) left behind from activities aimed at reducing fire risk such as fire-smarting and cutting fire breaks. First, the volumes of wood fibre here are relatively small, after whole logs are removed, compared to overall space heating needs, and will not constitute a reliable source of fibre on an annual basis over the long term. Also, the carbon emissions from gathering and transporting this material to a central site have not been accounted for and will make the value of the exercise questionable. Perhaps most important, removing this wood fibre from where it grew results in removal of a substantial set of nutrients from the local plant communities compromising future plant growth, especially in Yukon with its nutrient-poor soils. This is on top of the same effect resulting from removing whole logs. A much more ecologically sustainable approach is to chip the “waste” wood material on site (as is often done along Yukon’s highway rights-of-way). Breaking it into small pieces will reduce its availability as fuel in a wild fire, and will encourage decomposition (slower ultimate emissions of its carbon to the air than burning it) and local recovery of soil nutrients. We recommend that this Action be removed from the strategy.

Overall, we recommend that biomass energy be removed from this document as a suitable replacement source of energy for space heating.

Energy Production

This section deals largely with the exploration and promotion of “renewable” energy sources to replace fossil fuels. This is good if those renewables do actually reduce emissions. Although biomass energy can be considered “renewable”, it is an energy source with high carbon emissions and should not be lumped with solar, wind and geothermal (as we discuss under *Reducing greenhouse gas emissions (Goal 1)* above). We recommend that biomass energy be removed from this document as a suitable replacement source of energy for space heating.

This section leaves out hydro-electricity generation in the discussion of renewables. This is a serious oversight. Although large-scale hydro-electricity generation with dams on major rivers should not be

¹⁷ Yukon Initiative for Healthy Air. http://www.yukoncmoh.ca/files/YIHA-CMOH-Recommendations_2019.pdf

pursued in the territory¹⁸, the strategy should give small-scale hydro generation associated with headwater lakes and associated small drainages serious attention, because these can be developed with relatively small ecological effects and footprints. Good examples from this region include the generating facilities associated with Surprise Lake and Pine Creek near Atlin, British Columbia, and with Dewey Lakes near Skagway, Alaska. We recommend that small-scale hydro-electricity generation be included in the list of renewable energy sources addressed by this section of the strategy, with Actions included to build on the serious work that has already been done to explore potential sites.

Action #68 (Research the potential to use nuclear energy in Yukon, including small modular reactors) is important and worth pursuing. We need to know more about this potential source of energy, especially as it might be employed at communities and mines..

Communities

We are particularly interested in the section: *Respond to the impacts of climate change on wild species and their habitats.*

We are disappointed that this topic is placed within the Human Communities section of the strategy. The whole topic of natural environments, and their full suite of habitats from water bodies to wetlands and forests, deserves a section of its own in the strategy. And it deserves expansion beyond the small set of Actions now in the draft strategy. This is mainly because intact landscapes (i.e. those without human modification) are themselves part of the solution to the climate change problem. We recommend that the strategy include a section, at the same organizational level as Transportation or Energy Production, dealing with Natural Ecosystems.

Why is this so important? First, on an annual basis intact landscapes absorb massive amounts of carbon. Annual carbon absorption or removal from the atmosphere is one the two cornerstone policy imperatives for solving the climate crisis, the other being reducing emissions (which is a primary focus of much of this strategy). When left intact, wild landscapes will continue to absorb carbon. When they are disturbed (such as by new road developments, timber harvesting, infrastructure development), the rate at which they absorb carbon decreases. Yukon's intact landscapes are providing an immense ecosystem service to not just Yukoners but globally. This needs to be explicitly recognized with associated Actions in the strategy.

Second, intact landscapes are currently storing huge amounts of carbon in plants, soils, and water. Disturbance of landscapes by people and fires causes much of the stored carbon to be emitted to the atmosphere, in the short-term by burning, and in the longer term through faster decomposition from dead plants, soils and permafrost which will melt faster. Carbon storage is another massive ecosystem service provided by Yukon's intact landscapes.

¹⁸ von Finster, Al and Donald Reid, 2015. Potential Impacts and Risks of Proposed Next Generation Hydroelectric Dams on Fish and Fish Habitat in Yukon Waters. Wildlife Conservation Society Canada Conservation Report No. 8. Toronto, Ontario, Canada. Available at: <https://www.wcscanada.org/Publications/Conservation-Reports.aspx>

We recommend that the strategy explicitly recognize the ecosystem service provided by intact landscapes in Yukon and that these services have value and benefit at least nationally if not globally.

We also recommend that the strategy include an Action to better quantify the scale of these ecosystem services (carbon absorption and carbon storage) and how they vary geographically around the Territory, and how they are affected by human and wildfire disturbances.

Wild fires turn carbon stores into atmospheric carbon, and therefore are a huge problem in the climate change crisis. In the context of risk of increasing fire frequency and severity (which the strategy needs to acknowledge), we need to better target our fire-fighting to reduce the risk of losing mature and old growth forests. These forests are likely to be reduced in extent by fire, below their historical extent regionally, and have particularly high habitat value for focal wildlife (e.g., caribou winter ranges, riparian bird communities). They are often the landscapes with highest carbon storage. We also need to better understand what factors are driving so many human-caused fires in the territory, how those relate to specific human activities, and how they can be reduced.

We recommend that the strategy include an Action to direct the prioritization of fire-fighting efforts based on the mapping of existing carbon storage and absorption capacity (noted above), plus mapping of old growth forests with particularly high wildlife habitat values.

We recommend that the strategy include an Action to develop policy recommendations on how to reduce fire risk, based on improving our understanding of how land use practices (e.g., mineral exploration and extraction, agriculture, and new road access) affect fire risk, the incidence and patterns of human-caused fires, and fire regimes.

In the draft strategy, the whole topic of wild species and habitats (better described as Natural Environments) is only noted as having importance under the Goal – Adapting to climate change. This is a large misrepresentation of the importance of Natural Environments in the full suite of goals in this strategy. There are carbon and economic benefits to be derived from protecting intact landscapes and associated ecosystems and biodiversity. Keeping landscapes intact is a strategy that directly supports Goal 1 – Reduce greenhouse gas emissions – because these landscapes generally emit less than human influenced landscapes, and emissions need to be viewed in a carbon budgeting or net sense with absorption from the atmosphere built into the equation. Keeping landscapes intact is a strategy that directly supports Goal 4 – Build a green economy – because intact landscapes provide the habitat for fish and wildlife that support the traditional economy and local foods, they provide natural resilience to extreme weather events such as heavy precipitation and flooding, and they are the foundation of the ecotourism and outfitting industries. We recommend that the strategy more realistically depict the role of Natural Environments in fulfilling the Goals of the strategy.

Under the objective *Respond to the impacts of climate change on wild species and their habitat* we generally support the various proposed Actions (91 through 95). However, this Objective only talks about “responding” to change. We can do much better than that. We must be pro-active if we are going to adequately deal with climate change impacts on ecological systems. We need to plan, set goals, identify indicators, monitor, conduct research, and then adapt management (i.e. respond) as necessary.

There is a large body of scientific research, modelling and thinking that Yukon Government needs to be part of, and which WCS Canada is pursuing to some extent, that can help with a pro-active planning approach to mitigating the risks ahead. We recommend that the wording of this Objective be changed to reflect greater urgency and opportunity for pro-active effort in this regard, rather than passive waiting to see what will happen.

Four of five Actions in this section use the verb “continue”. However, it is not clear to us that Yukon Environment is actually involved in or has accomplished much in regard to “establishing a network of protected areas in response to climate change”, or in “developing solid research programs to assess the impacts of climate change on ecosystems”. So, continuation needs more evidence to assess. Also, these endeavours will require significant new investments to the budgets of Yukon Environment to achieve results, and such investments need to be earmarked in the final strategy. We recommend that the strategy include some text to show the current state of achievement in these “continuing” Actions.

Innovation

No specific comments

Leadership

Ensure the goals of this strategy are incorporated into government planning and operations

Action 122 (Create a Clean Energy Act that legislates our greenhouse gas reduction targets, renewable energy generation targets and our commitment to energy efficiency and demand-side management to hold the Government of Yukon accountable to the commitments in this strategy). This is an important Action that we support. We need clear legal definitions of “clean” in an energy production context, and legislated carbon emissions targets are important to avoid potential future political indifference to the issue. We recommend that this Action be kept and supported.

Action 123 (Consider greenhouse gas emissions and climate change adaptation in major Government of Yukon policies, programs and projects by applying a climate change lens to decision-making). The verb “consider” is too weak in this context. Building a climate change lens into decision making is essential given the current crisis. We recommend that the wording in this Action be changed: “Apply a climate change lens regarding greenhouse gas emissions and climate change adaptation in all major Government of Yukon policies, programs and projects”.

Increase public awareness of this strategy and how businesses and individuals can make a difference

Action 133 (Implement a Yukon-wide information campaign about climate change, energy and green economy). We agree that this is an important Action if it is complete and factually accurate in its messaging. We have raised two serious concerns throughout our review, - one about the inaccuracies of promoting biomass energy, the other about the serious omission of the role of intact landscapes in climate change mitigation and adaptation. We recommend that any “information campaign” needs to inform Yukoners that i) biomass is roughly equivalent to fossil fuels in contributing to our short-term

carbon emissions and ii) Yukon has a unique opportunity to manage its carbon budgets by protecting its intact landscapes rather than developing them.