**From:** A Climate to Thrive, Johannah Blackman
**To:** Maine Climate Council
**Subject:** Comments of Draft 2024 Climate Action Plan Update
**Date:** Tuesday, October 22, 2024 4:37:49 PM



Greetings!

Thank you for the opportunity to provide feedback on the draft climate action plan update for Maine Won't Wait. Please find my comments below.

**Overarching comments:**

1. While I appreciate the efforts being made to include the feedback of diverse community members and organizations, I am disappointed that the draft was released on October 15 and comments were due on October 22. As an organization that works closely with communities, including small rural municipalities that face significant capacity struggles, we were frankly embarrassed to communicate this timeline to our audience and encourage feedback within only five business days. I would encourage the council to provide more of a window in the future, and increase ease of pathways to submit feedback. For example, having the draft on a webpage with a table of contents that brings folks to different parts of the plan with ease, while also including that organization of the plan upfront would be a simple, easy step. I think a better format for feedback submission would also be ideal.
2. As always, I am proud to live in a state with a climate council and climate action plan and such a robust effort in climate work. That being said, I see themes in this plan that concern me and seem to signify a backwards slip in ambition at a time when dedicated action is more important than ever. Including action items like the study of "alternative fuels", for example, signifies that the climate council is attempting to appease partners like the natural gas industry, for example. While I appreciate the desire to engage everyone in this work, we ultimately need to make some difficult decisions and risk angering certain entities if we are to succeed in lowering emissions quickly enough. Compromises are important, but I'd appreciate seeing the council be transparent where compromises are being made, pairing the acknowledgement with transparent information explaining why that compromise is important and how it ultimately furthers the state's climate action goals. To simply include what are clearly compromises without such acknowledgment dilutes the validity of this plan and council as a trusted champion of climate action. We are so fortunate to have the Maine Climate Council, the opportunity of this plan, and GOPIF and other state offices behind the process. I don't want to see us miss the potential of that opportunity.
3. Climate action is inherently intersectional. As a director of a climate action organization, I recognize that it is necessary to organize information in clear "strategy areas", but I think the plan could do a significantly better job of highlighting points of intersection between strategies. Such an acknowledgement can promote intersectional action and collaboration and reduce duplication of effort.
4. Communication is perhaps the most important and least recognized action item. We need significantly more robust education focused specifically on solutions communities

can undertake and how people can be involved. This communication/education builds collaboration, capacity, and can even combat negative mental health impacts. I've seen the benefits of such programs first-hand through ACTT's Climate Ambassadors Program. I believe communication as an important solution was discussed by the Community Resilience Working Group but it needs a lot more attention in this plan. Education for all ages is really critical! Specific education for municipal leadership is a must.

**Comments by Strategy Area:**
(Please note, these comments are directly informed by ACTT's work in community-driven climate solutions which involve countless conversations about climate solutions community members of diverse backgrounds want to see at this point and how they can access those solutions.)

**Strategy A**

- More than 20% of EV charging infrastructure goals need to be fast chargers. Community members need fast chargers to feel ready to adopt EV's and municipalities need fast chargers to electrify their fleets. Additionally, the grid upgrades that are needed to connect these fast chargers are important grid strengthening measures we need to be taking, so the benefits are cross-cutting.
- More ambitious goals and coverage of rail transportation, please!
- More around vehicle-to-grid pilots and resilience connection, please!

**Strategy B**

- I'd like to see a prioritization of weatherization, which makes sense in Maine. We can see from Efficiency Maine Trust's numbers that participation in insulation programs is significantly lower than heat pumps. Heat pumps are really important, but in poorly insulated buildings, they do not perform well, and this can spread misunderstanding about the efficacy of heat pump technology. We need to see more outreach and assistance given specifically for insulation work, which is more complicated and more difficult to gain buy-in around than heat pumps. I hope high goals can be set in this area.
- A statewide energy coaching program would really help gain participation in insulation programs. I'd like to see specific goals around implementing such a program (perhaps based on York Ready for Climate Action's program), and funding directed to such a program. While these programs can seem laborious, they do work, and, based on my experience in on-the-ground work, they are really needed and communities are requesting this type of support.
- It is really important to support communities throughout the state in adopting the Stretch Code. I'd like to see a public education effort funded and supported near-term, as we don't have time to be building inefficient new construction while we wait for a 2028 goal related to the Stretch Code.

**Strategy C**

- We need specific measurables around improving the interconnection process of renewable energy projects.
- I'd like to see a recommendation around utilizing something like ACTT's workshop series in community-driven energy solutions to help support the adoption of Distributed

Energy Resources, a key step in both the equitable transition to renewable energy and increased energy resilience.

**Strategy E**

- I'm really happy to see the emphasis on food waste reduction!
- I hope that Strategy D.5 means we will see funding for this work in future Community Action Grants in the Community Resilience Partnership.

**Strategy F**

- F.3 is very important. Federal grant program processes remain prohibitive for most small communities and the small organizations that know them best. The Community Resilience Partnership's process is really spot-on in terms of level of requirements. Channeling federal funds through similar programs would really help increase access for communities throughout Maine and the organizations that serve the communities.
- F.7 - YES, so happy to see the plan directly address mental health. The importance of programming and funding related to this cannot be overemphasized.
- I see that the land use and solid waste recommendations were brought under strategy F. It would be great to see them called out more clearly, as the organization here feels rushed -

Thank you again! I know a lot of work goes into this process and I look forward to seeing the final draft and resulting action!

Johannah Blackman (she/her/hers)
Executive Director

*Working together to make MDI energy independent by 2030 and an epicenter of citizen engagement, sustainability, and economic vitality. Get involved at [www.aclimatetothrive.org](http://www.aclimatetothrive.org)*

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Advancing the Clean Energy Future
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October 22, 2024

Dear Co-Chair Pingree and Co-Chair Loyzim,

You have requested comment on the draft Report issued late last week. Acadia Center and other Maine organizations previously commented on the Climate Council's plans in a letter dated September 16, 2024, but Acadia Center would briefly like to respond to the draft Report's "Transportation Strategy A." Acadia Center is a non-profit research and advocacy organization committed to advancing the clean energy future. Acadia Center tackles complex problems, identifies clear recommendations for reforms, and advocates for policy changes that support a low-carbon economy across the Northeast.

**1. Ensuring EVs are Available Should Remian a Top Priority**

Placing as many EVs on Maine roads as soon as possible must continue to be a top Maine priority. The challenge that remains is how best to implement that solution. Barriers to the widespread adoption of EVs in Maine include misinformation and misunderstandings about EVs. For instance, the draft Report cites market availability as an inhibitor to current EV adoption. This assumption is outdated. EVs are now available and in stock in Maine dealerships and from car companies that choose not to use dealerships, such as Rivian and Tesla. Indeed, according to Kelly Blue Book, one model of EV, the Tesla Y, was the top selling car in the world in 2023, and in the top 5 in the United States, and the trend continues in 2024. Another barrier is the cost of EVs. However, GM, Ford, Hyundai and Kia all offer currently available EVs with range over 250 miles all low as $32,000 and there is an ever-growing used EV market as well. In 2024, the average price of a vehicle was over $47,000. To ensure that low - and moderate - income households can take advantage of these opportunities, we should elevate the incentives for these populations to the maximum extent practicable. Finally, Maine agencies and Offices should use existing staff or create positions at agencies called "EV Ambassadors" or "EV Experts." These Experts or Ambassadors could reach out to individuals, communities, and auto dealers to help Mainers transitioning to EV ownership and sales.

2. **Recent Maine Legislation Requires a Fulsome DEP Study of EV Barriers in Maine to be Completed by January 2025.**

Acadia Center was instrumental in passing a law requiring the Maine Department of Environmental Protection (DEP) to collaborate with other state agencies and GOPIF and the GEO and to develop a report to "evaluate relevant barriers to the adoption of zero-emission vehicle standards or requirements in the State." 38 M.R.S.A. Section 585-D. Further, the law requires that the report "must include an analysis of zero-emission vehicle adoption rates in the State relative to national trends and identification of barriers to achieving higher adoption rates, identification of strategies to reduce those barriers with particular consideration given to barriers present in rural communities and an evaluation of policies or market trends for overcoming those barriers." Acadia Center encourages the Climate Council to emphasize the importance of the timely completion of this report, which can be critical to the future of EV adoption in Maine.

3. **Encourage Innovative Public Transportation Projects**

Encourage "outside the box" thinking on public transit, with projects like "Metro Connect" the Portland Metro on-demand bus service project. Portland Metro is starting a pilot program that will allow public transit riders to order bus service on demand. Projects like this can use smaller buses and potentially serve smaller communities where there is not

enough ridership initially to support full bus routes. It also has the potential to encourage public transit because it is more convenient for riders.

Acadia Center appreciates all the many efforts of the Maine Climate Council generally, and the opportunity to comment on this draft Report.

Peter LaFond, Senior Advocate and Maine Program Director

Acadia Center

plafond@acadiacenter.org

207-329-4606

**From:** Nick Battista
**To:** Siegel, Amalia
**Cc:** Susie Arnold; KellyBoyd, Margaret
**Subject:** MCC Draft Comment
**Date:** Tuesday, October 22, 2024 4:44:17 PM
**Attachments:** image001.png

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Hi Molly – I wanted to share a quick comment with you about the draft climate action plan.

1 – Island Institute generally supports and applauds the draft plan, there are many important strategies contained in the document.

2 – **Protect critical working waterfronts** – Island Institute hosted a roundtable discussion this morning to hear from various working waterfront businesses. Overall, we heard businesses and community leaders say that the ideas expressed in the draft climate action plan are helpful and needed. There were specific comments about

- **Support for Statewide Working Waterfront Strategy** - We need a more diverse set of tools in our tool kit – there is a diversity of working waterfronts in Maine and they each face multiple issues. This will require a range of tools and also some coordination about how those tools are deployed in various ways. This comment was explicitly linked to the bullet point about the State needing a working waterfront strategy.
- **Support for resilience investments of multiple kinds** – Existing state funding has been critical for immediate storm response and working waterfront businesses have needs that extend well beyond what was captured through that process. Additionally, the engineering, permitting, and knowledge base to make large scale resilience improvements is scarce and hard to come by. Additionally, it is important to be doing smaller resilience upgrades keeps these places working because a full upgrade or the wholesale replacement is very expensive. These comments track well with the bullet about increase the resilience of public and private working waterfronts.
- **Public Private Partnerships are going to be critical** – tackling the challenges facing the state are going to take new, strong, sophisticated public private partnerships that involve multiple levels of government, working waterfront business owners, and bridging or community based organizations.
- **Working waterfronts are deeply connected to communities** – Community Shellfish, in Bremen, employs 22 people at the working waterfront itself, supports over 30 boats, each with a captain and at least 1 crew member, meaning over 80 people make their living directly from this facility. After the winter storms in 2024, the fishermen and families who are supported by the facility showed up to repair the damage. This work was done because the working waterfront was important to the community – more important than just a physical location for people to work. This comments helps

highlight the overall importance of keeping this section in the climate plan and the appropriateness of having it in the community resilience section.

Thank you for all you have doing.

Nick

**Nick Battista** (he,him,his)
Chief Policy and External Affairs Officer


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islandinstitute.org

**From:** Julie Beane
**To:** Maine Climate Council
**Subject:** Comments on Draft 2024 Climate Action Plan
**Date:** Monday, October 21, 2024 9:49:30 AM

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I respectfully submit the following Action Plan comments for consideration:

1) Please include an accounting for and acknowledgement of the environmental impact and considerations regarding the sourcing of materials for EV batteries, as well as lifespan and recycling of those betteries. The box on p5 includes "Accounting for the environmental impact of EVs requires considering impacts related to fuel production, processing, distribution, and use;" perhaps here would be a logical spot.

2) On pp 4&5 the term "common sense" policy solutions is used. Please consider replacing this jargon with more words that more specifically convey meaning.

3) Explicitly encouraging the increased consumption of Maine seafood seems oddly specific given there is no benefit to the climate from such action (and in fact harmful to the climate without first eliminating the significant use of diesel fuel by fishing boats). The broader references to eating more locally sourced foods are appropriate.

Thank you,

Julie Beane
Brunswick, ME

**From:** noreply@informe.org on behalf of Office of Policy Innovation & Future
**To:** Siegel, Amalia; Maine Climate Council
**Subject:** Webform submission from: Contact the Maine Climate Council
**Date:** Thursday, October 17, 2024 7:51:34 AM



Submitted on Thu, 10/17/2024 - 07:49

Submitted by: Anonymous

Submitted values are:

**My comments are about:**
Draft 2024 Maine Won't Wait

**First name**
Juliana

**Last name**
Beecher

**Email**
juliana.beecher@gmail.com

**Town/City**
Portland

**Affiliation/Company**
Oak Ridge Institute for Science and Education

**Job title**
Research Fellow

**Message**
I commend the co-chairs and working groups on the development of the draft 2024 update to Main-Won't-Wait. As a member of the Materials Management Task Force, I read the draft plan with an eye on the aspects I'm most familiar with: food waste and other organics. I am especially glad that the recommendation to reduce food loss and waste by 50% by 2030 made it into the final recommendations.

Reducing food waste is a powerful action for creating a more equitable and secure food system and reducing methane emissions from landfills. Increasing capacity within the food donation, food processing and storage sectors is an important step. Education to households and businesses is essential. However, I was disappointed that increasing support for composting infrastructure was not mentioned in the draft plan at all! Composting is an excellent way to manage food scraps - it's far cheaper and faster to stand up than anaerobic

digestion facilities, and it is scalable to a fit a community's needs. Composting food scraps, yard trimmings, manure, etc. keeps those organics out of landfills, reducing methane emissions. Increasing support for composting across the state means supporting a diverse and distributed solid waste infrastructure - ideal for Maine's geographic variations. Community composters like Chickadee Compost and Scrap Dogs provide essential services to their communities wh ile also raising awareness about the effects of food waste on the climate and environment. Businesses like these should be supported through funding and incentives - especially if anaerobic digestion gets additional support, don't leave out composters! While anaerobic digestion captures biogas that can be turned into renewable energy, it's expensive and systems are often leaky (more leaky than we thought - there are studies taking place that show significant fugitive methane from AD). Digestate - the solids left at the end of the AD process - must be managed. While it can be a fertilizer or soil amendment, it generally does not have the nutritive value or carbon content that makes compost such a valuable soil amendment. The only mention of compost in the draft plan is as landfill cover - that's ridiculous! Compost is too valuable as a soil amendment to be promoting the use of it on landfills - especially when that is the only place compost seems to have in this climate action plan! The climate and soil health benefits of composting and compost use are numerous and well-studied. See below for sources.

In short, I suggest the following: 1) add support for distributed composting infrastructure under recommendation F.10; 2) mention composting as a way to keep food scraps and organics out of landfills and reduce methane emissions and add to evaluate subsidies and other forms of support for composting under E.7; remove mention of compost as landfill cover in E.7, or change "compost" to "biologically active landfill cover"; consider adding compost use as a way to build soil health, increase soil organic matter on farmlands, sequester carbon, restore degraded soils, and support ecosystem health and ecosystem services - a compost procurement incentive could help to bolster the marketplace for compost and compost-containing products, thereby increasing the viability of composting businesses.

One final edit: on page 40, in E.7, the plan notes that methane is 80 times more potent than carbon dioxide. This is true if considering a 20-year horizon, but global warming potential is often discussed and calculated based on a 100-year horizon. Methane is still far more powerful than CO2, but 28 times, not 80, on a 100-year horizon. I suggest changing "80 times" to "28 times" in the draft plan. https://www.epa.gov/ghgemissions/overview-greenhouse-gases#methane

Sources - many more available upon request:

The Benefits of Compost. US Composting Council.
https://www.compostfoundation.org/Education/Publications

Composting and Climate Action Plans: A Guide for Local Solutions (Institute for Local Self-Reliance, 2024): https://ilsr.org/wp-content/uploads/2024/04/Composting-and-Climate-Action-Plans-A-Guide-for-Local-Solutions-April-2024.pdf

Healthy Soils and Compost Policy Guide (Institute for Local Self-Reliance, 2024): https://ilsr.org/wp-content/uploads/2024/04/Revised-Healthy-Soils-and-Compost-Policy-Guide-April-2024.pdf

From Field to Bin: The Environmental Impacts of U.S. Food Waste Management Pathways

(U.S. EPA, 2023): https://www.epa.gov/system/files/documents/2023-10/part2_wf-pathways_report_formatted_no-appendices_508-compliant.pdf

The Compost & Climate Connection. Compost Research and Education Foundation. https://www.compostfoundation.org/Education/Publications

MORRIS, J., BROWN, S., COTTON, M. & MATTHEWS, H. S. 2017. Life-cycle assessment harmonization and soil science ranking results on food-waste management methods. Environmental science & technology, 51, 5360-5367. https://pubmed.ncbi.nlm.nih.gov/28414913/

GILBERT, J., RICCI-JÜRGENSEN, M. & RAMOLA, A. 2020. Benefits of compost and anaerobic digestate when applied to soil. Report, 2, 68-70. https://www.altereko.it/wp-content/uploads/2020/03/Report-2-Benefits-of-Compost-and-Anaerobic-Digestate.pdf

FARHIDI, F., MADANI, K. & CRICHTON, R. 2022. How the US Economy and Environment can Both Benefit From Composting Management. Environmental Health Insights, 16, 117863022211284. https://pubmed.ncbi.nlm.nih.gov/36262199/

BROWN, S. 2016. Greenhouse gas accounting for landfill diversion of food scraps and yard waste. Compost Science & Utilization, 24, 11-19. https://www.tandfonline.com/doi/abs/10.1080/1065657X.2015.1026005

**From:** Joe Blotnick
**To:** Maine Climate Council
**Subject:** Comments on the Draft 2024 Climate Plan Update
**Date:** Tuesday, October 22, 2024 9:47:08 AM



Dear Council Members,

Thank you all for the tremendous work that you are doing and for this exceptional and well-written draft. Please consider these comments.

**Strategy A**
**1. Accelerate Maine's Transition to Light-Duty Electric and Plug-In Hybrid Electric Vehicles**

Why should only 20% of EV chargers be fast chargers? Yes, it costs more to upgrade the grid, but that is a worthy goal, too. And where you have upgraded the grid to put in a few fast chargers, why not put in twice the number at the same site which will be needed as EV growth continues. Where there are only 2-3 fast chargers at a stop and they are being used, it is a big barrier.

With EV range increasing every year, widely spaced Level 2 chargers are less important. I can't travel long distances with my EV even though there are a number of Level 2 chargers along the way because it takes too long to continue our journey.

**2. Accelerate Maine's Adoption of Zero-Emission Medium- and Heavy-Duty Vehicles (MHDVs)**

Why not encourage a mix of standard size electric school buses and smaller, more efficient electric buses or vans for small schools or routes. The idea that all school buses should be the same size is archaic and wasteful.

**3. Invest in Public, Active, and Shared Transportation**

The plan mentions rail transportation only once!

The Maine Rail Group (MRG) in Augusta has developed a plan for extending the Amtrak Downeaster from Brunswick to Rockland and last year Amtrak won a federal grant to study that. I believe MRG is also promoting the idea of ferry service on a straight-line from Rockland to Southwest Harbor which could bring some of the Acadia's 3.2 million visitors per year. The passengers could then be picked up by the well established Island Explorer bus network. Rail along Route 1 in the summer would reduce congestion and climate emission.

A second important line would be higher-speed rail from Portland to Bangor (the trip takes 5.5 - 7 hours) which is also being explored, and why not the University of Maine in Orono?

The arguments against extending rail -cost and lack of ridership, are the same ones made

against extending the creating the Downeaster to Portland and extending it to Brunswick which have proven to be wrong. Patricia Quinn, executive director of Northern New England Passenger Rail Authority, which oversees operation of the Downeaster said “In 2020, leading up to COVID, we were breaking ridership and revenue records almost every month.”

**Strategy B**
**Continue progress on making homes and businesses more energy efficient by investing in weatherization and heating systems**

Giving oil to low-income households who are freezing is the right thing to do. Are these households required to switch to heat pumps in the following year, and are there subsidies that could help them install them at little or no cost? Assistance the following year might have to be in the form of electric subsidies. We should not be giving money to burn more oil.

**Strategy E**
**3. Increase the amount of food consumed in Maine from state food producers to 30 percent by 2030**

This comment is related to food, but does not seem to be addressed. The livestock industry contributes between 12% and 18% of the total GHG emissions. Replacing meat in school lunches with healthy, tasty plant-based options should be a goal. Again, we should not subsidize non-climate friendly practices.

Best.

Joe Blotnick
(207) 266-5590

**From:** noreply@informe.org on behalf of Office of Policy Innovation & Future
**To:** Siegel, Amalia; Maine Climate Council
**Subject:** Webform submission from: Contact the Maine Climate Council
**Date:** Tuesday, October 22, 2024 9:27:34 AM



Submitted on Tue, 10/22/2024 - 09:27

Submitted by: Anonymous

Submitted values are:

**My comments are about:**
Natural and Working Lands Working Group

**First name**
Kathryn

**Last name**
Busko

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**Town/City**
Bangor

**Affiliation/Company**
University of Maine

**Job title**
Food Rescue MAINE Communication & Education Intern, Student

**Message**
I am happy to see that Strategy E, point 4 aims to reduce food loss and waste by 50% by 2030. This is an often overlooked, but important way to mitigate our climate impact. However, to achieve this goal, consumer education needs to be further emphasized in this plan. Consumer education is mentioned a few times, but it needs to be on equal footing with tracking & measuring and rescue, recovery, & donations. The 2024 Food Loss and Waste Generation study found that residences generate 36% of wasted fo od in Maine (as was pointed out in this plan). If the state aims to reduce food loss and waste by 50%, it needs to reach people in their households. While important, the strategy of tracking and measuring for large producers does not address the residence sector. Maximizing food rescue, recovery, and donation has the potential to address some of the problems in this sector, but it is not enough. If the state aims for people to follow through with donation and recovery, it needs to emphasize consumer education. I am an Environmental Science student, but until becoming a food waste prevention

intern, I did not understand the full extent of the food waste problem. When I tell people about my job, I find that they don't spend much time thinking about food waste. If we want people to reduce their food waste, we have to tell them why and how. As we know that younger generations waste more than older generations, I would recommend taking advantage of platforms such as Instagram and TikTo k to reach those audience. Another possibility is to educate students in school, since we know that not only do those children come away with a better understanding of how to manage food waste, but they also speak to their families about it. We won't be able to achieve significant progress on this issue without involving people at the household level, and the best way to do that is through a specific, targeted effort to educate consumers.

Conservation
Law Foundation

For a thriving New England

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*via electronic mail*

October 22, 2024

Maine Climate Council
Co-Chairs Hannah Pingree and Melanie Loyzim
maineclimatecouncil@maine.gov

Subject: Draft 2024 Climate Plan Update (October 15, 2024)
Comments of Conservation Law Foundation

Dear Co-Chairs Pingree and Loyzim and Maine Climate Council Members:

Conservation Law Foundation (CLF) appreciates your review of these comments regarding the October 15, 2024 draft of the climate action plan (the "Draft") as you deliberate to finalize the 2024 Climate Action Plan. The Draft reflects the work of hundreds of people and countless hours over the course of nearly a year,[1] and it is replete with solutions for boosting Maine's economy and supporting our communities while reducing climate-damaging emissions. We respectfully submit these comments to suggest ways to make the Draft even stronger and more actionable.[2]

*More specificity will lead to better implementation*

Maine's "Climate Law" (38 M.R.S. § 576-A – 578) establishes the framework within which the Council is developing the Climate Action Plan. The Climate Law demands reductions in climate pollution to avoid the worst impacts of climate change. The Council must ensure that the strategies in the Climate Action Plan add up to at least a 45% reduction in greenhouse gas emissions by 2030 and an 80% reduction by 2050 (the "climate pollution limits"). With these numeric objectives, the law dictates a numeric component to the Council's work.

The Draft sets forth myriad good recommendations, but what is missing in many cases is quantitative objectives and action deadlines. Without numbers, who can say whether rebates go far enough or investments are adequate to put the state on track with the 2030 and 2080 climate pollution limits? We are aware that "updated metrics" are forthcoming, but the blank spaces in

[1] CLF is grateful to have advocates serving on both the energy and transportation working groups (although we complied with the Co-Chairs' request that we step away from the Transportation Working Group during the pendency of our lawsuit seeking to enforce provisions of the Climate Law, 38 M.R.S. § 576-A(4)).
[2] While the state has provided previous opportunities for comment, until now, the public has only had access to recommendations of the working groups. This has been the only opportunity to review a draft of the plan itself. While CLF appreciates this opportunity, only a "portion of the report" is available, and it lacks "metrics and implementation priorities"—arguably the most important details for understanding how the plan will facilitate achievement of the climate pollution limits. Providing less than one week for review hampers the ability to provide effective comments.

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the Draft are limited, and many more recommendations do not appear poised for quantification. In many instances, metrics and details are missing from the Draft even where working groups suggested them. The "Implementation Next Steps" in the working groups' deliverables are particularly useful and we strongly suggest the Council append something akin to those to the Climate Action Plan to better capture the breadth of thought that has gone into developing the recommendations.

In the same vein, we urge you to make language changes throughout the Draft to better convey the urgency with which the Climate Action Plan must be implemented and to give state agencies more guidance as to what they are supposed to do and when. There are many examples throughout the Draft of noncommittal language like "consider" or "monitor" instead of "do" or "require;" as well as non-specific directives like "help," "support" or "work" instead of concrete steps for action. The more specific the directive, the better state agencies will understand their responsibilities and the better Mainers, municipalities, businesses and other entities can appreciate their respective roles, too. We emphasize the importance of the Council specifying measurable actions with defined timelines to ensure the Climate Action Plan's strategies add up to compliance with the climate pollution limits—the first of which is now only five years away, demanding aggressive and urgent action.

The Draft also lacks detail with respect to how the emissions modelling presented to the Council on October 16 will be achieved. Evolved Energy Research's emissions modeling should undergird the recommendations in the Climate Action Plan, and it's unfortunate that it has come so late in the process. Last week's presentation to the Climate Council revealed that the 2024 Climate Action Plan will be less bullish on cleaning up vehicles than Maine Won't Wait (2020), particularly with respect to medium- and heavy-duty vehicles.[3] To make up the difference and still hit the 2030 climate pollution limit, Evolved Energy Research emphasized the need to rely on hydrogen-derived fuels.[4] The Draft offers little detail on that topic—advising the state should "explore" alternative fuels like hydrogen for medium- and heavy-duty vehicles; "monitor" hydrogen for the electricity grid; and surmising that fuel switching "*could* include transitions to green hydrogen" and thermal generating resources "*could*" be powered by hydrogen in the coming years.[5] If the Council is countering less ambitious vehicle electrification with use of hydrogen fuels, we hope the final Climate Action Plan will provide significantly more detail on that topic, including metrics and time frames.[6]

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[3] Evolved Energy Research for the Maine Climate Council, Maine Climate Council Emissions Study (Oct. 16, 2024) at 4, 5.
[4] *Id.*
[5] Draft at 5, 18, 22, 25 (emphasis added).
[6] The Draft's references to hydrogen do not begin to address the complexities of ensuring that hydrogen is "green," nor do they grapple with the significant cost and practical barriers to utilizing it. Given the advanced state of electrification technologies in the heating and transportation sectors, and in some applications within the industrial sector, we generally do not think that pursuit of hydrogen is a good investment for Maine and only support hydrogen for high-temperature, hard-to-electrify applications.

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*Room for improvement with respect to equity and engagement*

Although we applaud the engagement of priority populations that took place as part of the Draft's development, the timing seems to have been too late for meaningful incorporation of those takeaways into the Draft. Procedural equity is a precursor of substantive equity. The Equity Subcommittee's 2023 report to the Maine Climate Council provided many important recommendations for both procedural and substantive equity, and there is still ample room in the Draft for more incorporation of those suggestions.

Finally, we acknowledge the statement in the University of Maine's report, "Engaging Low Income and Disadvantaged Populations in Maine Climate Planning" (Sept. 1, 2024) about the need for government-to-government dialogue with tribal governments that respects tribal sovereignty. References to tribal governments are sparse in the Draft. We hope that the "government-to-government dialogue" described is underway, and we urge the Council to be more explicit about the value of those conversations.

Specific Suggestions for Strengthening the Draft's Recommendations

There are many recommendations in the Draft that we wholly support, though in most instances, as noted above, their efficacy would be improved by setting metrics and timeframes, and by more specifically identifying key actors and actions. For brevity's sake, we do not note every recommendation we support, nor every area that would benefit from greater detail. Instead we highlight below key areas that should be strengthened in the final draft.

Strategy A: Embrace the Future of Transportation in Maine

1. Accelerate Maine's Transition to Light-Duty Electric and Plug-In Hybrid Electric Vehicles

   - The Council's consultant emphasized just last week: "Vehicle Electrification is the Largest Source of Emissions Reductions in the Near-Term," and "Electric Vehicles [are] Key to Cost Effective Reductions."[7] Yet, the Draft omits the most critical policy lever for advancing electrification of personal vehicles: the Department of Environmental Protection's adoption of rules to reduce emissions and bring more clean vehicles to Maine, namely the Advanced Clean Cars II program.[8] While the Draft's recommendations are critical for building a solid foundation for electrification, they aren't enough on their own. By calling for an unidentified entity to "advance common-

[7] Evolved Energy Research for the Maine Climate Council, Maine Climate Council Emissions Study (Oct. 16, 2024) at 9, 10.
[8] Cadmus for the Governor's Energy Office, Governor's Office of Policy Innovation and the Future, Maine Clean Transportation Roadmap (Dec. 2021), at 2, 29-30.

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sense policy options" without detail,[9] the Draft punts on a question undergirding the success of the Climate Action Plan and the state's compliance with the climate pollution limits: how will Maine ensure that the transition to electric vehicles happens fast enough?

- We applaud setting a target percentage of EV rebates and other financing opportunities to reach low- and moderate-income drivers to help ensure the benefits of transportation electrification are spread across the state and across income brackets (and we hope the target reflects the percentage of Maine's population identified as such).[10] We also urge the Council to adopt the Transportation Working Group's recommendation and explicitly call out the need for education campaigns targeted at gas "superusers," "drivers often residing in more rural areas who typically average more than 40,242 miles per year."[11] Research shows that transitioning gas superusers to electric vehicles has more pronounced emissions benefits while saving more money and reducing transportation energy burdens for people who need it most.[12]

2. Accelerate Maine's Adoption of Zero-Emission Medium- and Heavy-Duty Vehicles

- Even with the Council walking-back ambition toward cleaning up medium- and heavy-duty vehicles,[13] there is no time to lose in aggressively advancing this beneficial transition to zero-emission trucks, vans and buses. Like in the light-duty space, the Draft again declines to endorse the most important policy lever for moving transportation electrification markets in Maine—adoption of the Advanced Clean Trucks rule. And again, the Draft suggests someone "[a]dvance common sense policy options, including utility and regulatory approaches," telling Mainers and Maine agencies next to nothing about who is supposed to do what, and by when.
- The Council should set an earlier date for zero-emission pilots and should be more specific about how the state will "support" these projects.[14] Pilots should be part of a long-term plan to execute at full scale; they should set concrete goals and be designed to demonstrate replicable success in key sectors of Maine's trucking economy.
- More aggressive "lead-by-example" objectives could go far toward demonstrating viability of zero-emission technologies across the state. The Council should recommend the state set a date by which to electrify all state-owned medium- and heavy-duty trucks, buses, ferries, and boats to demonstrate performance, reliability and cost savings for the private sector industry. The state does not currently have any zero-emission

[9] Draft at 3.
[10] Draft at 3.
[11] Transportation Working Group recommendations at 7, 43.
[12] *See* Coltura, Maine Gasoline Superusers Fact Sheet.
[13] *See* Evolved Energy Research for the Maine Climate Council, Maine Climate Council Emissions Study (Oct. 16, 2024) at 4, 5.
[14] Draft at 5.

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targets for medium- and heavy-duty vehicles in its own fleet, which does not reflect the state of the market.[15]

3. Invest in Public, Active, and Shared Transportation

- We are pleased the Draft added a specific target for increasing transit ridership, though we question whether a 5% increase by 2030 is adequate to achieve the 20% reduction in light-duty vehicle miles traveled that is targeted by the same year.[16]
- The Council should specify that the recommendation to "invest in clean transportation programs. . . to help offset emissions from other transportation projects that could increase vehicle traffic" should be a legislative requirement imposed on Maine DOT and the Maine Turnpike.[17] Investment in transportation infrastructure should account for Maine's climate pollution limits, lest expansions undermine the good work being done elsewhere.
- We emphasize the importance of working with local governments and stakeholders on the design of the programs, routes and other investments contemplated here.

4. Improve the resilience of Maine's transportation system

- We urge the Council to strengthen this recommendation with greater detail. We suggest the Council recommend the Legislature require all relevant state agencies such as MaineDOT and the Maine Turnpike Authority to conduct climate vulnerability assessments of all transportation assets, and create adaptation plans to address climate risks by December 2026. Further, these agencies should be required to evaluate climate risks for all projects and incorporate best practices for climate-resilient design guidelines and standards as appropriate.

Strategy B: Modernize Maine's Buildings: Energy Efficient, Smart and Cost-Effective Homes and Businesses

1. Continue progress on making homes and businesses more energy efficient by investing in weatherization and heating systems

- We support targets for installation of heat pumps in low-income homes and weatherization of low-income homes.[18] The targets should reflect the percentage of Maine's population identified as such.

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[15] *See* Governor's Office of Policy Innovation and the Future, Governor's Energy Office, State of Maine Lead-by-example Report 2023-2024 at 11.
[16] Draft at 6.
[17] Draft at 7.
[18] Draft at 11.

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- We support the Draft's recommendation to "[c]ontinue to participate in regional initiatives to promote replacement of gas-fired hot water heaters with heat pump water heaters."[19] The Council should go further even than the Building Working Group's recommendation and recommend *adopting* "state emissions standards for heating appliances."[20]

2. Build and renovate more housing that is affordable, energy efficient, and close to vibrant community centers

- The clean and energy-efficiency affordable housing units should be constructed in areas at less risk of climate impacts, as should the compact development promoted near community services and transit, to limit new construction in areas with higher risk of climate impacts.[21] Units that are retrofitted for energy efficiency should also be retrofitted to withstand climate impacts.

5. Accelerate decarbonization technologies in industrial processes

- We urge the Council to more strongly endorse pilot and demonstration projects (e.g., "conduct" instead of "consider"[22]) for industrial heat pumps, ensuring that pilots are designed for replicability and fit within a plan for moving markets, expanding education and awareness, and ultimately more broadly deploying industrial heat pumps.

Strategy C: Transition to Clean Energy

1. Decrease energy burdens while transitioning to clean energy

- We urge the Council to incorporate more specifics from the recommendations of the Energy Working Group. We strongly support setting a target for reducing energy burden for low-income residents and ask the Council to consider setting that target in the Climate Action Plan, rather than waiting another year.[23] Some of the emphasis on supporting low-and moderate-income residents appears to have gotten lost between the working group's recommendations and the Draft, and we urge inclusion of those priorities. We also suggest inclusion of the working group's recommendation to maximize federal funding to help lower energy burdens for low- and moderate-income households.[24]

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[19] Draft at 12.
[20] Building Working Group Recommendations (June 2024), at 3, 31.
[21] Draft at 14.
[22] Draft at 17.
[23] Draft at 21.
[24] Energy Working Group Recommendations (June 2024) at 2.

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- While we appreciate inclusion of adequate funding for core energy assistance programs for low-income families, we support the working group's focus on ensuring a *sustainable* funding source,[25] versus the Draft's recommendation for a continual assessment of funding.

2. Plan and build the infrastructure needed to achieve a resilient and 100 percent clean electricity grid by 2040

- The Council should insert into the final Climate Action Plan the working group's explicit reference to regional policy coordination and cost sharing with respect to competitive clean energy procurements.[26]
- The Draft calls for investment in a sustainable, Maine-based offshore wind industry.[27] The Council should expand in the Climate Action Plan that Maine should invest in the necessary monitoring and scientific research to fill critical gaps in our understanding of the Gulf of Maine environment and current uses there to advance responsible development of offshore wind.
- The Climate Action Plan should recommend improving, modernizing and expediting the process for interconnecting clean energy projects to both the distribution system *and* the transmission system.[28]
- The Draft's endorsement of "clean fuels, including hydrogen and bio-based fuels"[29] does not appear to be drawn from the Building Working Group's recommendations and are perhaps a result of Evolved Energy Research's emissions modelling. As mentioned above (fn 6), the Draft does not grapple with the complexities of hydrogen—indeed, for hydrogen and bio-based fuels to be deemed "clean fuels" requires a number of conditions to be satisfied, none of which are discussed—and it is critical that any use of hydrogen, or bio-based fuels comply with Maine's climate pollution limits as well as our clean energy requirements (*see* 35-A M.R.S. § 3210).
- The Draft's endorsement of "highly efficient combined heat and power production facilities"[30] is undercut by the example given of the Legislature's wood-fired combined heat and power program,[31] which is inherently inefficient.
- The Draft does not go far enough with respect to siting and permitting reform ("Improve the efficiency, predictability, and transparency of state siting and permitting processes while providing meaningful public engagement opportunities.").[32] The working group recommended a "review and evaluation" of these processes in the

[25] Energy Working Group Recommendations (June 2024) at 2.
[26] *See* Draft at 22; Energy Working Group Recommendations (June 2024) at 3.
[27] Draft at 22.
[28] *Compare* Draft at 22 *with* Energy Working Group Recommendations (June 2024) at 3.
[29] Draft at 22.
[30] Draft at 22.
[31] Draft at 24.
[32] Draft at 22.

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"immediate or near-term,"[33] and urged that Maine consider "establishing a formal commission to provide recommendations for potential reforms to remove barriers to responsible clean energy infrastructure development."[34] At a time when it is widely recognized nationally that our approaches to siting and permitting demand a fresh look and new approaches, the Draft suggests a status quo approach with no associated timeframe —that agencies should "continue to seek to reduce barriers."[35] Similarly, the Draft is inadequately aggressive in encouraging state regulators and utilities to "continually improve and modernize the process for connecting clean energy projects to the grid."[36] This crisis demands that we fund, authorize and encourage our agencies to do more, not simply more of the same.

3. Manage the impact of buildings, vehicles, and industry on the grid with innovative demand management and load flexibility strategies

- The Draft incorporates the recommendations from the Building Working Group, except omits the recommendation to ensure equitable access to and equitable distribution of benefits from these demand management strategies.[37] The Council should insert that recommendation, including the associated tracking and reporting recommendation, into the Climate Action Plan.

Strategy E: Protect Maine's Environment and Natural and Working Lands and Waters

1. Increase the total acreage of conserved Natural and Working Lands in the state to 30 percent by 2030.

- The Draft is largely focused on lands with respect to the state's 30x30 goal. We suggest the Council add more emphasis to coastal and marine waters in this section. For instance, the Draft identifies the amount of currently protected lands and the rate at which protections need to increase in order to meet the 30x30 goals—but provides no similar metrics or timelines with respect to oceans. Further, to meet 30x30 goals on land and increase the rate of land conservation, the Draft calls for "permanent, ongoing funding source for the for Maine's Future Program."[38] No similar call for funding is made for marine and coastal conservation. And while this section obliquely mentions the carbon storage benefits of coastal and marine habitats, this is in contrast to an entire sub-section dedicated to increasing forest carbon storage. We suggest the goal of fostering blue carbon could be more pointed. For instance, we suggest incorporating the

[33] Energy Working Group Recommendations (June 2024) at 15.
[34] Energy Working Group Recommendations (June 2024) at 13.
[35] Draft at 24.
[36] Draft at 25.
[37] *Compare* Draft at 25 *with* Energy Working Group Recommendations (June 2024) at 4.
[38] Draft at 35.

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Working Group's discussion of the concept of "blue carbon," which "should encompass all coastal and marine ecosystems that contribute to carbon uptake and storage, not just traditional habitats like eelgrass beds and salt marshes, necessitating further research into the carbon sequestration potential of diverse habitats including kelp forests and tidal flats."[39]

- We support the recommendation that "Maine should convene a state-wide process by the end of 2025 to identify important coastal and marine habitat types. . ."[40] However, "identification" is inadequate at this juncture. The Council should strengthen this recommendation to include not only identification but also *protection* of essential habitat area. We suggest the Council again consult the recommendations of the working group to enhance this recommendation.[41]
- To enhance resilience, we also suggest the Council make the following amendments:
  - Focus on areas that are richly biodiverse, have high potential to draw back and store carbon, are culturally and economically important, ***can help communities withstand climate impacts***, and/or that can improve equitable public access.[42]
  - Restore and increase the resilience of coastal, marine, and inland habitats, prioritizing areas that connect to already conserved lands and waters, ***can help protect communities or resources from climate impacts,*** and promote ecosystem connectivity and health.[43]

4. Reduce food loss and waste 50 percent by 2030

- Preventing food waste is an important greenhouse gas emissions reduction strategy and this objective is a welcome addition to the Draft. Wasted food has an outsized greenhouse gas impact and is responsible for more than half of landfill methane emissions. Food diversion, including composting, greatly reduces greenhouse gas emissions. However, the Draft fails to provide concrete recommendations for achieving this objective. First, the Draft aims to "divert ten percent more food from landfills by 2030."[44] In light of the overarching objective to reduce food loss and waste *50 percent* by the same year, this is inadequately ambitious. Further, it is unclear how requiring annual reporting—versus requiring landfill diversions—would actually achieve this objective. Many other states, such as Vermont, Massachusetts, Connecticut and Rhode Island, ban food waste from landfills in different ways. These laws are in various states of being phased in and have had varying degrees of success, but demonstrate that Maine should be aiming higher.

[39] A Report from the Coastal and Marine Working Group of the Maine Climate Council (June 5, 2024) at 18.
[40] Draft at 36.
[41] *See* A Report from the Coastal and Marine Working Group of the Maine Climate Council (June 5, 2024) at 20-23.
[42] *See Draft* at 35.
[43] *See Draft* at 35.
[44] Draft at 38.

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5. Support Maine's farming, forestry and fisheries industries in adapting to climate change

- We support the goal to "[p]romote stewardship of resilient ecosystems that support innovative markets resilient to climate change, and grow opportunities in fisheries, aquaculture, forest products, and agriculture,"[45] but the Draft provides little with respect to enhancing resilience of ecosystems. Maine needs to mitigate the many stressors *additional to* climate change (invasives, runoff, noise, etc) and then in the case of exploited species also manage/adapt fisheries in a way that deals with changing conditions (e.g., shifting distributions, new species coming in) and builds climate resilience (e.g., prevent overfishing, rebuild depleted populations, adopt precaution in face of climate uncertainty). We encourage the Council to revisit the Coastal and Marine Working Group's recommendation for fodder on how to manage fisheries for climate resilience and sustainability.

7. Reduce and capture methane emissions from Maine's waste sector

- Requiring development and implementation of a plan to reduce methane emissions from Maine's waste sector by 2030 is inexplicably slow. We urge the Council to include a sooner date to more quickly address this source of emissions.
- An emphasis on reducing waste and reducing landfills is largely missing from the Draft. Capturing methane has inconsistent results, and monetizing methane capture can perversely incentivize landfilling—Maine should instead be focused on reducing production of methane in the first place. As evidenced in Maine's solid waste hierarchy, landfilling is an outdated way of handling our waste. The Climate Action Plan should emphasize implementing strategies to reduce waste, including by producing and using less (source reduction), recycling, reusing, composting, and waste to energy systems.

Strategy F: Build Healthy and Resilient Communities

9. Measure and reduce emissions across the lifecycle of products that Maine people buy and use

- We urge the Council to recommend establishing "Lead by Example" standards well before 2030.

[45] Draft at 39.

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* * *

Thank you very much for your time and consideration of these comments.

Sincerely,

*/s/ Emily K. Green*

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Conservation Law Foundation
53 Exchange St. Suite 200
Portland, Maine 04101
egreen@clf.org

| | |
|---|---|
| **From:** | Rob Sargent |
| **To:** | Maine Climate Council |
| **Subject:** | Comments on Draft Climate Plan-- Data-driven approaches to maximizing the environmental, economic, and equity benefits of electric vehicles in Maine |
| **Date:** | Tuesday, October 22, 2024 4:31:16 PM |
| **Attachments:** | image001.png<br>Maine - State Superuser Mini Report w-maps.pdf |



**To:** Members of the Maine Climate Council
**Fr:** Rob Sargent, Policy Director, Coltura
**Re:** Data-driven approaches to maximizing the environmental, economic, and equity benefits of electric vehicles in Maine
**Date:** October 22, 2024

I'm writing on behalf of Coltura to urge you to include recommendations in the updated Maine Climate Plan to steer electric vehicle deployment toward households who use more gasoline. Using gasoline consumption data enables more strategic policies focused on switching the biggest gasoline users to EVs first, an approach that maximizes the vehicle emissions and air pollution avoided per EV. It can also help advance equity by providing financial relief to the drivers who spend the biggest share of income on gasoline. (Attached, please find a summary of the Maine findings of our recent report).

We were encouraged that the Transportation Workgroup's final transportation policy recommendations report; recommended targeting EV programs and incentives to target "specific groups such as (gasoline) Superusers, which are drivers often residing in more rural areas who typically average more than 40,242 miles per year." We hope that recommendation gets adopted in the Maine Climate Council's final report.

We also urge you to make gasoline reduction a key metric for the planning and evaluation of programs designed to reduce greenhouse gas emissions. A data-driven approach will help ensure that we are maximizing the benefits of our EV programs and give us more confidence that we'll succeed in getting the transportation sector emissions cuts to align with the state's targets.

Sincerely

Rob Sargent
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he/him/his
linkedin.com/in/thisisrobsargent

COLTURA
Moving Beyond Gasoline

# MAINE

## **Maine's** 118,000 Biggest Gasoline Users Spend 13.6% of Household Income on Gasoline

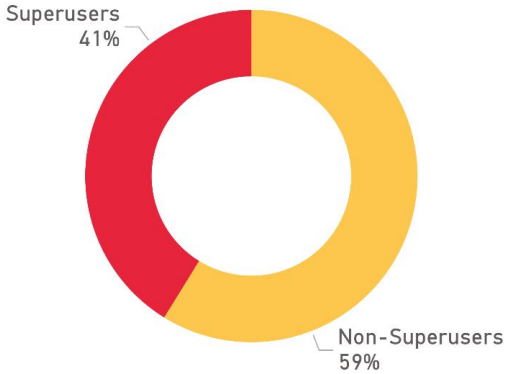
### Maine Gasoline Facts

- "Gasoline Superusers" are the top 10% of light-duty vehicle drivers in the U.S. in terms of gasoline consumption. In Maine there are 118,000 Gasoline Superusers.
- While Superusers are just 14.5% of Maine drivers, collectively they use 41% of the gasoline (223 million gallons/year).
- Maine Superusers burn an average of 1,883 gallons of gasoline a year – 4x more than other drivers.

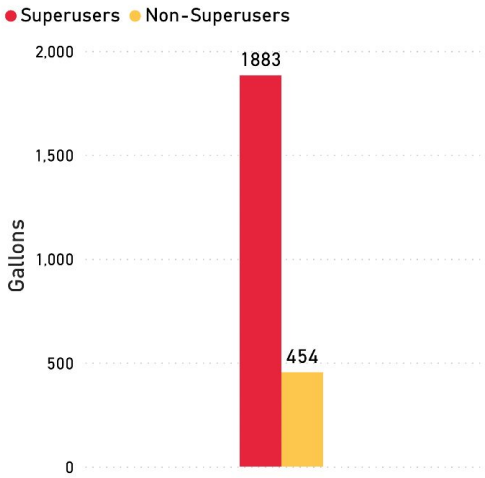
*Maine Superusers: General facts*

**118K**
Superusers

Gasoline Consumption Shares

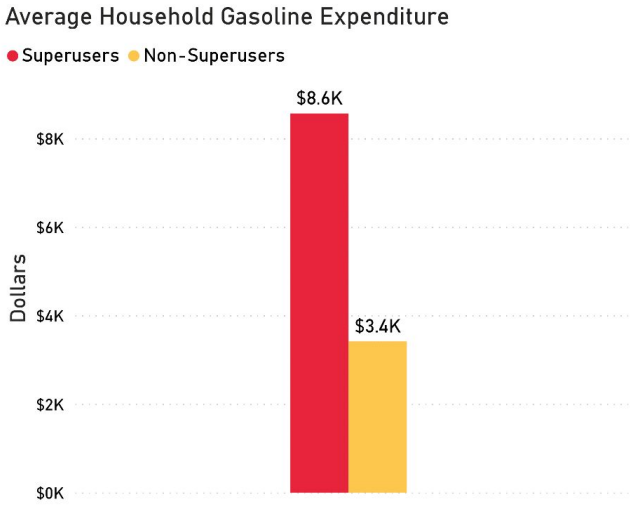


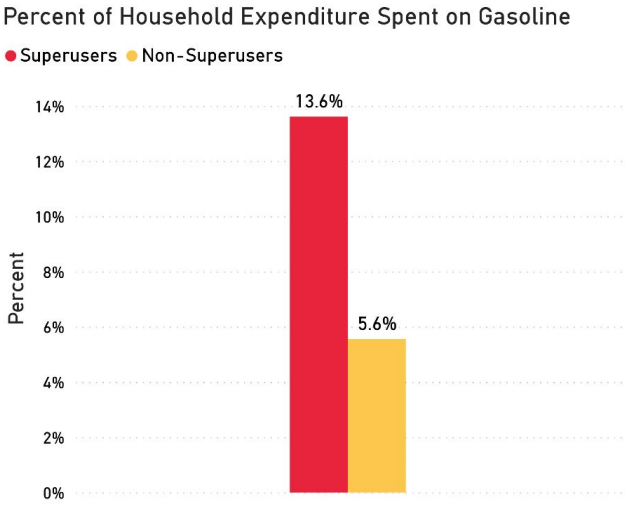

Average Annual Gasoline Consumption



- Maine Superuser households spend on average $8,562 annually on gasoline, representing 13.6% of their income, versus other households at 5.6%.

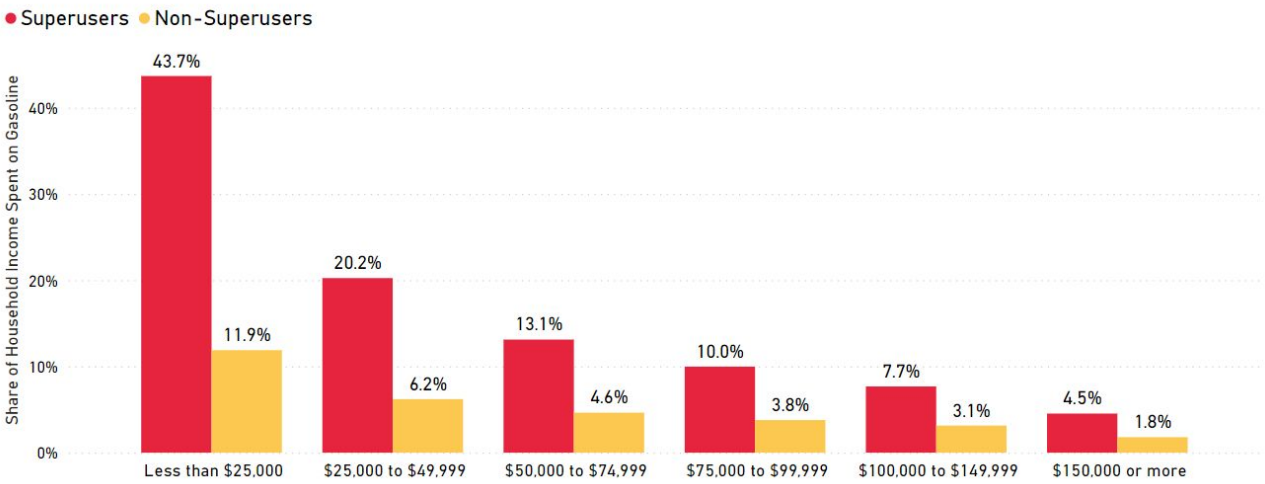
## *Maine Superusers: Expenditure*



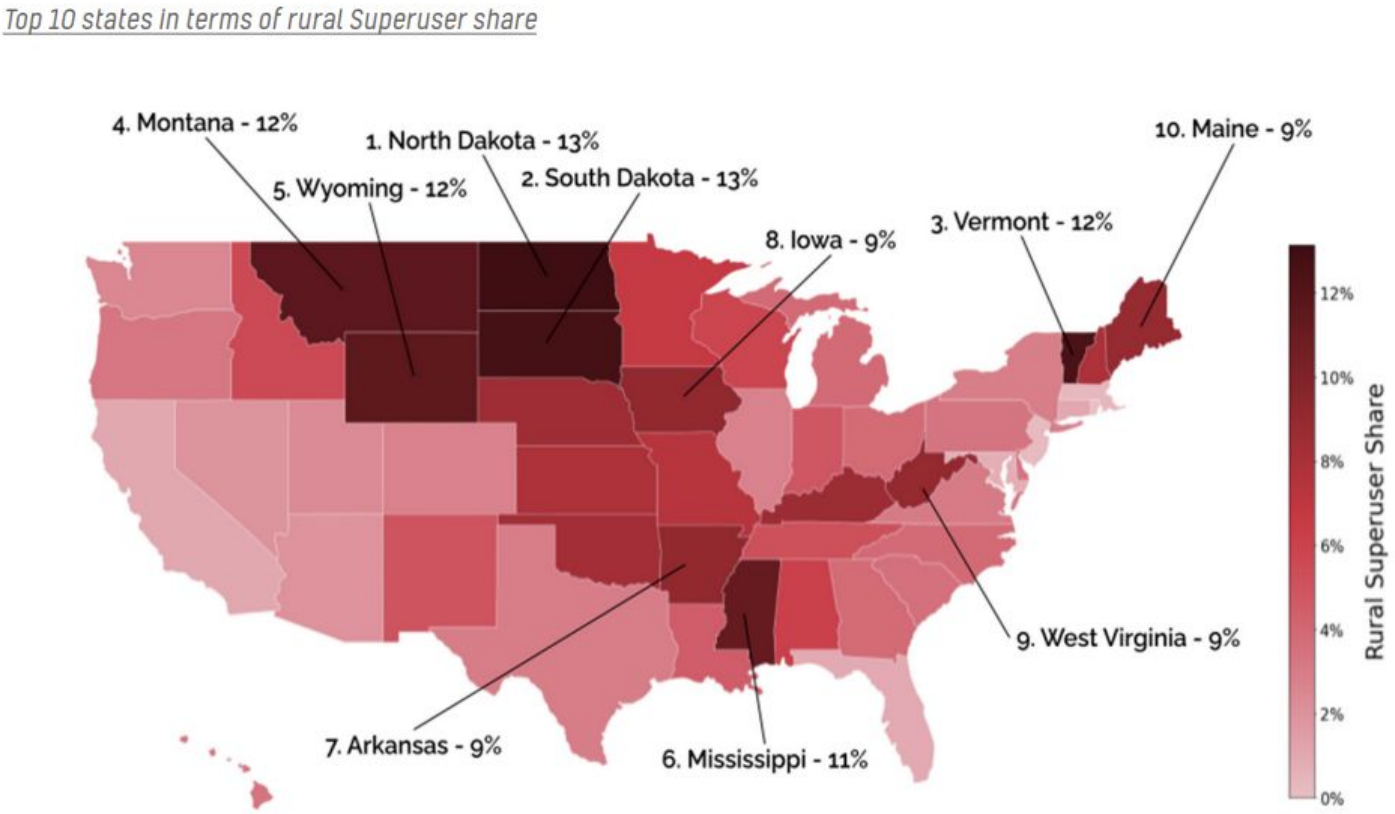




- 44.3% of Maine Superuser households earn below the state median income of $75,160 and spend on average 21.2% of their income on gasoline.

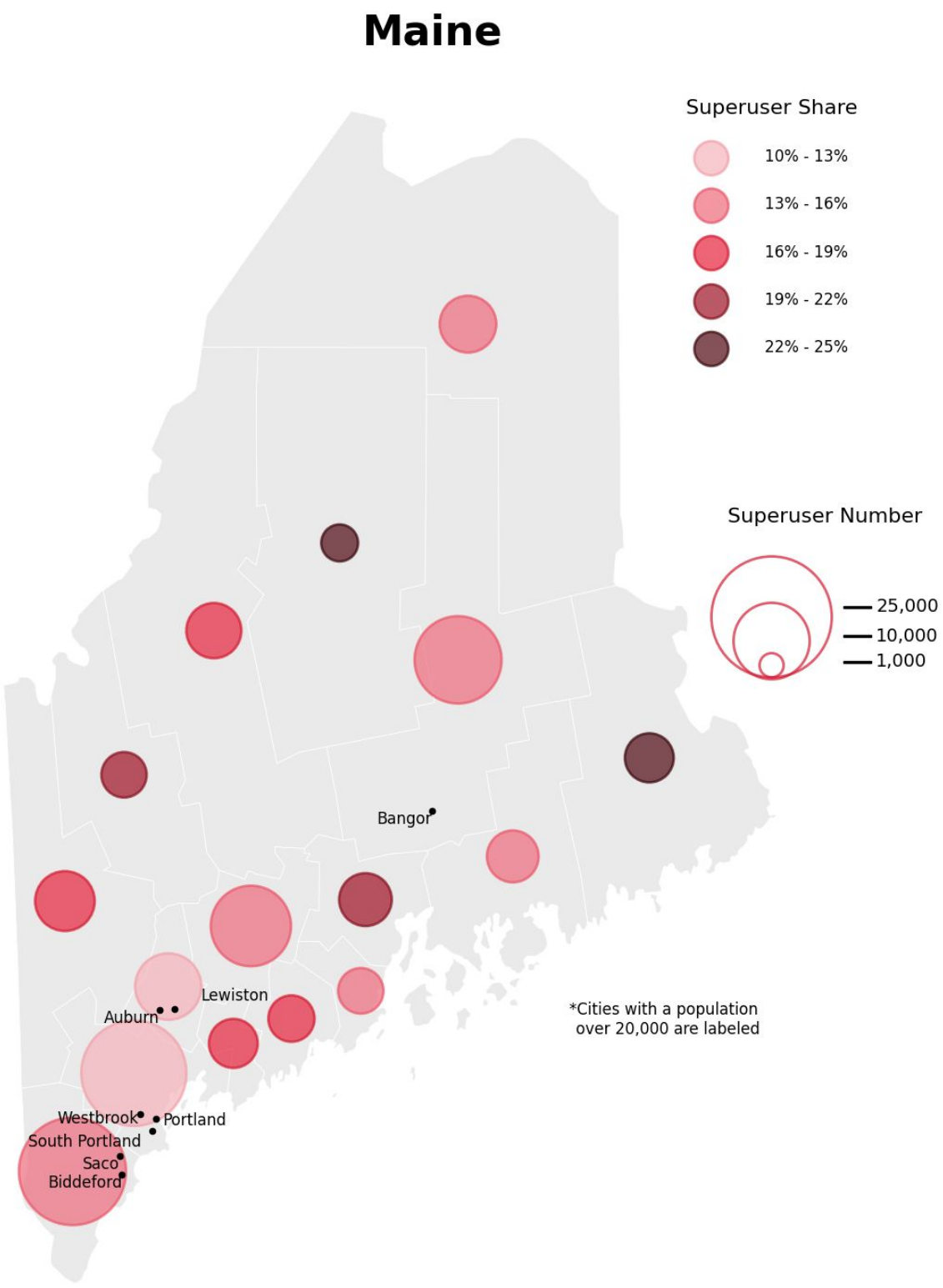
## *Maine: Average share of household income spent on gasoline by income bracket*

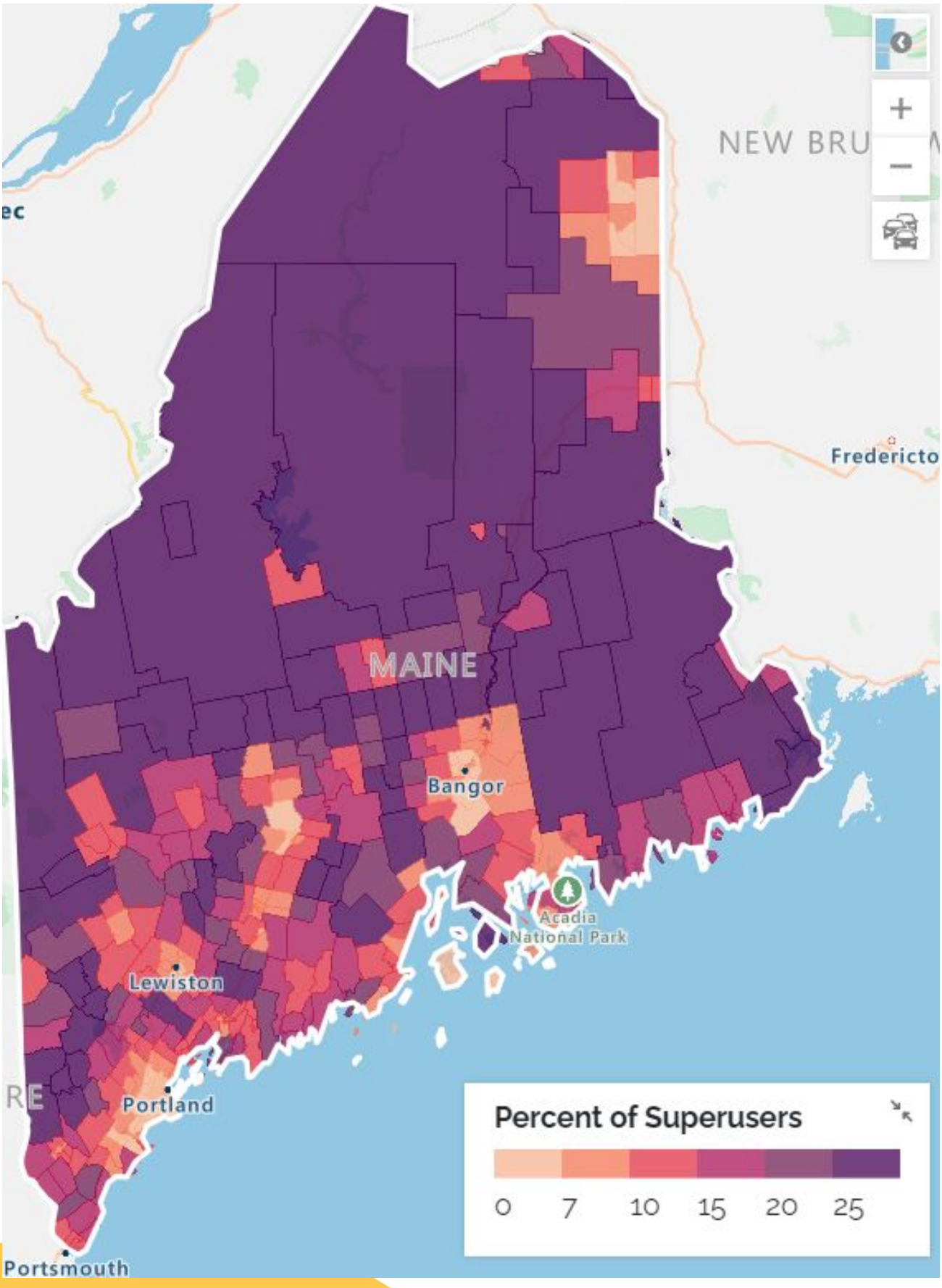


# Maine ranks 10th in the nation for share of rural gasoline superusers



## Gasoline Superusers by County




NEW BRU
ec
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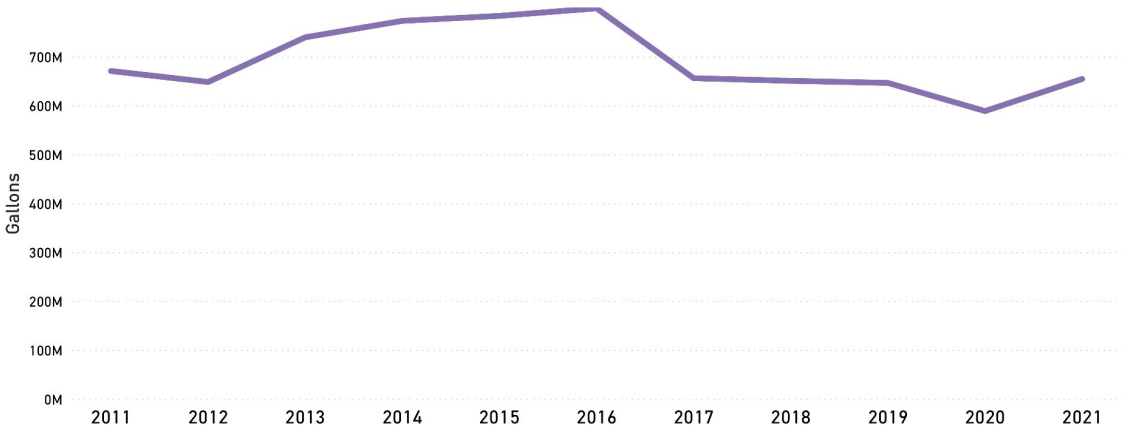
MAINE
Bangor
Acadia
National Park
Lewiston
RE
Portland
Portsmouth
Percent of Superusers
0
7
10
15
20
25

- 81.5% of Maine Superusers live in rural areas.
- Maine's gasoline use has stayed largely flat over the last decade, jeopardizing its ability to meet climate goals.

*Maine gasoline consumption (2011 - 2021)*




## Prioritizing Superusers' Switch to EVs

**Climate Benefits:**

- A Maine Superuser switching to an EV has 4x the climate impact of other drivers switching, on average.
- Switching all Maine Superusers to EVs would cut Maine's transportation carbon emissions by 18.9%, and its total carbon emissions by 9.3%.

**Equity Benefits**

- Switching to an EV would save low/mid income Maine Superuser families on average $255 a month on fuel (gasoline savings minus electricity expenditures) and hundreds more on maintenance.
- These monthly savings are often sufficient to cover the monthly payments on the EV.

## Policies for helping Superusers switch to EVs

- Target EV education and outreach to Superusers, focusing on the huge savings they could realize by switching to an EV.
- Modify Maine's EV rebate program to prioritize low/moderate income drivers who are also Superusers.

For demos of more gasoline data and insights available for your state, visit Coltura's Gasoline Data Insights and Gasoline Consumption Map.

**From:** Donna Gold
**To:** Maine Climate Council
**Subject:** Maine Won"t Wait_Sears Island public comment
**Date:** Tuesday, October 22, 2024 1:00:20 AM
**Attachments:** The Peoples Island.pdf

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Dear Ms. Siegel,

Attached is a link to my public comment, a sampling of some of the stories of Sears Island we've gathered over the summer. You can see it here: https://heyzine.com/flip-book/9e5a65b419.html (or this one: https://heyzine.com/download/app/9e5a65b419.html)
or read the attached pdf

Here's the introduction:
*Huntin*', says one. *Mourning* says another. *Recharging* says a third. They walk and run, bike and ski, swim and kayak, skip rocks, walk dogs, discover birds in the bushes and metals in the ground. People from up the road and those from half a world away come to teach their children about the cycles of monarchs and spring peepers, to witness the light streaming through forests and the sunset's glow as it floods the water and glimmers against the lights of Mack Point. To explore.

This people's island, Sears Island, is a place of mystery, of wildness, and yet accessible to those who can't walk or walk well.

As Bill and I hiked and biked the island this past summer, we asked those we met about their time on Sears Island—why they've come here, what they do, why they love it. What you're viewing here represents the launch of this volunteer project. Many more stories await from those who cherish Sears Island, who visit it frequently, who rely on it for joy, for amazement, and as a respite from their daily labors and life's accumulated scars.

Two strains run through these stories: love for this refuge and a potent mixture of bewilderment and dismay as to why such a beloved sanctuary would be given over to industry while Mack Point stands ready and able to accommodate the stated needs of the proposed windport and assembly plant in a manner that will be swifter and less costly to build.

This work-in-progress stands as a testimony from the range of people who understand that locating this project on Sears Island would alter the balance of nature and industry that is Searsport's identity. The solace of the island would be forever buried by the deforestation, the harvesting of tons of soil to be dumped into the ocean, and the 24-hour noise, traffic, and lights. We can't interview the birds or the trees, the springs or wetlands, or the dune. Only the humans. These fifteen stories represent but the tiniest fraction of people whose lives would be diminished by the industrialization of Sears Island.

Mack Point is not in the migratory passageway. It's not sequestering carbon. It's not a place of refuge—a sacred place of refuge—for the people of Maine and beyond. Mack Point awaits.

*—Donna Gold, Stockton Springs*

**From:** Edward Hanscom
**To:** Maine Climate Council
**Subject:** Comments on 2024 draft Climate Action Plan
**Date:** Monday, October 21, 2024 11:34:59 PM



Thank you for the opportunity to comment on the 2024 draft Climate Action Plan.
After reviewing the 2024 draft Climate Action Plan, I find a few areas in the draft plan that should be improved:

- The draft plan does not adequately recognize the likely growth of population in Maine due to the in-migration of people from regions experiencing the effects of rising sea levels and more extreme heat. This population growth could be much more and more widespread than the growth than the growth we have seen in recent decades and will require Maine to build our communities in a way that accommodates this growth but minimizes the climate impact to Maine. What we do not want is to accommodate growth through strategies that encourage sprawl.
- Promotion and incentivizing more compact development (part of strategy F-8) is a positive direction, but it should also minimize the increase in impervious surface area to avoid severe flooding impacts during intense rainstorms. This can be accomplished by mid-rise, multi-use, transit-oriented development and efficient shared-use parking (rather than single-use private parking lots). Compact development will also shorten the length of everyday trips and encourage more walking, bicycling, and public transit use for trip-making (serving strategy A-3).
- The draft plan appears to rely very heavily on the use of EVs to reduce emissions (strategies A1 and A2). However, due to the realities of battery range, weight, and cost, the conversion of the gasoline-powered fleet is proceeding slower than anticipated. Hybrids may be the most practical option for consumers of private vehicles for an extended period of time. Therefore, emissions reductions from a growing fleet of private vehicles will be disappointing.
- Another approach to reducing transportation emissions is converting highway vehicle-trips to trips by more efficient modes of transportation. Conspicuously absent from the transportation strategies (A1 thru A6) is the mention of railways --- for the movement of people or goods. The efficiency of steel wheel on steel rail, compared to rubber tire on asphalt, is well established. The power sources of locomotives have been evolving in parallel with those of trucks and buses. Already, significant amounts of freight movement by rail and the 2023 State Rail Plan expects that to triple. Travel on the Downeaster is at all-time record levels and continues to grow. With the increased

growth due to climate change in-migration facing us in Maine's future, the need for efficient rail transportation will be needed even more.

- By having an efficient rail network connecting Maine's major activity centers and freight generators to other states and provinces, Maine will have a more resilient surface transportation network (strategy A4) that doesn't rely solely on the highway system. The rail network can also serve as the spine of a transportation system that includes buses, biking, and walking for those who do not own a private automobile and do not want to contribute to sprawl and transportation emissions.
- To be sure that railways are there for Maine's resilient transportation network (strategy A4), existing tracks --- even those that are currently underutilized --- must remain in place. Rails with trails are possible, but trails in place of rails are counterproductive in terms of emissions. Not only is the rail potential lost, trail use, especially in rural areas, often generates more vehicle-trips and emissions.

reuse MAINE

October 22, 2024

**RE: Maine Won't Wait, Draft Climate Action Plan Update**

Dear Maine Climate Council Co-chairs, Hannah Pingree and Melanie Loyzim,

Thank you for the opportunity to submit comments regarding the draft climate action plan update. The following comments are submitted on behalf of Reuse Maine - a volunteer coalition of business, municipal, environmental and sustainability leaders in Portland, South Portland, and beyond who are actively working to catalyze and launch reuse systems in our state. Several of our members proudly serve on the council's new Materials Management Task Force (MMTF). **Waste is a signficant climate issue, and we are glad to see the addition of the MMTF and reference to strategies involving waste reduction and reuse in this update to the state's climate action plan.** We believe the draft identifies some key waste reduction and emissions reducing strategies to pursue, but also leaves room for more action and emphasis on waste reduction as a climate strategy.

As a coalition focused on reuse, we will focus our comments on elements of the draft that reference reuse specifically rather than on broader issues of waste, except that we hope to see a summary narrative in the updated climate action plan that highlights the rationale for the addition of the new MMTF and connects the dots between waste and our climate for readers.

**Below we call attention to three specific strategies outlined in the draft that we strongly support, but would like to see expanded. We would love to work with the council on these to identify specific action steps to help the State make forward progress.**

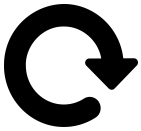
1) **Promote the manufacture and use of climate-friendly building products; reuse of building materials through salvage and deconstruction (page 16):**

Deconstruction, rather than demolition, offers significant climate benefits by reducing the volume of waste sent to landfills and lowering carbon emissions. By reusing existing buildings, or carefully dismantling them, materials such as wood, metal, and concrete can be reused or recycled, which not only conserves resources but also reduces the need for manufacturing new materials—thereby decreasing energy consumption and emissions. In Maine, most of our construction and demolition debris is landfilled and we have a significant opportunity to make forward progress in this area that not only has climate benefits, but could also create jobs and provide for lower-cost salvaged materials for building projects—while also conserving landfill space.

We specifically support this suggested action on page 18: “Require that by 2030, commercial and state-funded construction projects that meet certain thresholds (embodied carbon, structure size, etc.) be designed for deconstruction and reuse and sourced from reduced carbon materials.” We also urge the council to consider other ways that the State may coordinate reuse of building materials and encourage deconstruction of buildings, which could include a dedicated staff person, municipal ordinance guidance, or landfill bans for certain problematic construction and demolition debris that would require deconstruction to remove it from the disposal stream.

2) **Measure and reduce emissions across the lifecycle of products that Maine people buy and use (page 54).**

Supporting reuse, refill, and repair systems is essential to reducing waste and minimizing the environmental impact of our consumption habits. By extending the lifespan of products, we can significantly reduce the demand for new materials and the energy-intensive processes associated with manufacturing. Every product we buy contains embodied energy—the total energy used to produce, transport, and dispose of it. When we repair or reuse items, we conserve this energy and lower emissions. Setting "Lead by



Example" standards for state government and prioritizing practices like waste prevention, repair, and reusable alternatives can help Maine become a model for sustainable consumption. Additionally, exploring a consumption-based emissions inventory will give the state a clearer understanding of the full carbon footprint of its economy and guide further progress in achieving greenhouse gas reduction goals.

We strongly support these initiatives and are delighted to see them identified in the draft climate plan. As we look towards implementation of these strategies, we hope to see specific draft bill language and dedicated staff to carry out the tasks.

3) **Increase capacity of and access to waste prevention and diversion services (page 55)**

We appreciate that the draft plan highlights the critical need for waste prevention and diversion services like recycling in Maine. **However, the report misses a key opportunity to reference Maine's landmark Extended Producer Responsibility (EPR) for Packaging law, passed in 2021.** This transformational law is designed to provide municipalities with the necessary funding and technical assistance to implement recycling and reuse services. It's important to note that participation is voluntary, and we hope the State actively encourages municipalities to take advantage of this game-changing program that will provide a coordinated and cohesive approach to supporting municipalities who are responsible for providing waste prevention and diversion services.

**We applaud the Maine Climate Council for adding a MMTF and signaling support for reuse strategies in this draft climate action plan update.** We thank you for your time and consideration of these comments and look forward to working towards advancing the initiatives outlined in this draft.

Sincerely,

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**From:** Jill Higgins
**To:** Maine Climate Council
**Subject:** Comments on Maine Won"t Wait Draft
**Date:** Tuesday, October 22, 2024 11:32:06 AM



I just read the whole draft 2024 plan! It's excellent! Thank you so much for all this great thinking and diverse input gathering and such comprehensive goal setting. It's so uplifting to see all that has been started or accomplished here already. I am especially excited about the focus on education in the schools and other youth initiatives like the Climate Corps.

After my work as a coordinator of A Climate to Thrive, I have some suggestions about details:

Strategy A -

Include goals for expanding rail transportation, including high speed rail. If this currently has obstacles, at least there could be a goal about finding ways to overcome the obstacles.

A.1. As an EV owner, I suggest you increase the percentage goal of high speed chargers vs. slow chargers, even if you have to decrease the overall number of chargers. It's easy to charge our cars at home overnight, and the slow chargers are not very helpful when traveling.

A.3. Strengthen the goals for transit ridership. "Work with the Maine Transit Association to develop strategies to increase transit ridership by 5% annually to reach or exceed pre-COVID-19 ridership levels by 2029"

Strategy B -

B.1. Find and implement solutions to the problem of seasonal residences heating their empty homes throughout the winters.

Strategy D -

D.3. Add specific career tracks and certification programs in the public vocational & technical schools for the clean energy jobs that increasingly need educated and trained workers, including solar assessment and installation, weatherization, heat pumps, sustainable farming practices, climate adaptation, and energy-efficient, sustainable building design and construction.

Strategy E -

E.3. Support school (and university) gardens and farm to school programs

E.5. Specifically identify farming methods that reduce and sequester greenhouse gases.

E.7.  Include ways to educate, incentivize and support composting at all levels - homes, farms, towns, hospitals, restaurants, schools and universities, etc.

Thank you for all your good hard work!!

--
Jill Higgins
5 Lopaus Point Road, Bernard
207-664-4040

**From:** Frederick Horton
**To:** Maine Climate Council
**Cc:** tamara risser
**Subject:** Comment on Maine Climate Action Plan
**Date:** Tuesday, October 22, 2024 12:42:59 PM
**Attachments:** flyer_HF_Final Oct 3 2024.pdf
EBC version_en_10_3 (1).pdf

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Dear Hannah Pingree and Melanie Loyzim,

Thank you for the opportunity to comment on Maine's Climate Action Plan and for crafting an ambitious plan that is also quite readable. I run a start-up biochar manufacturer in Enfield, called Standard Biocarbon. Over the past few years, Standard Biocarbon has built what is now one of the world's most modern and technologically advanced pyrolysis plants in Enfield Maine. The plant is now fully operational, producing high quality biochar from wood chips from the Pleasant River Lumber Mill in Enfield Maine. We would not be where we are without support from the Finance Authority of Maine (FAME), Coastal Enterprises, Maine Technology Institute (MTI), US Forest Service and Pleasant River Lumber. Every ton of biochar sequesters roughly a net 3 tons of carbon dioxide for hundreds if not thousands of years. Bochar is now the leading carbon dioxide removal technology with potential for vast growth as demand for carbon removal grows. Standard Biocarbon's model is highly efficient, maximizing the concentration of carbon in the biochar, using highly efficient technology, building the facility at the Pleasant River Lumber Enfield Mill, eliminating the need to truck feedstock to the plant and using waste heat to dry green chips. The plant is a model of state of the art, clean, efficient biochar production. The operation will remove approximately 3,000 tons of carbon dioxide from the atmosphere every year and issue carbon removal certificates in global markets. Standard Biocarbon supports Maine forests by producing a carbon negative product, with tremendous growth potential out of a waste material, sawmill residuals

Over the past 3 years, we have been collaborating with the University of Maine. I am attaching a flyer of a recent study that found biochar reduced PFAs in tomatoes and lettuce. UM has also done trials using biochar to increase the ability of sandy soils to maintain moisture with the hope that it will help make Maine's blueberry crops more resilient to climate change. Hence, our product is not only beneficial in capturing carbon, but it also has the potential to help farms become more resilient. T

Now that we are running, it is crucial that we have the support the support listed in the actons found in the following two goals:

1. Advance innovation and leadership in technologies that help reduce emissions and increase resilience to climate impacts, and
2. Help Maine businesses and natural resource industries succeed in the global climate

and clean energy economy.

We would appreciate it if there were some mention of biochar and of Standard Biocarbon in the plan. It is critical that Maine leads in the biochar rollout with state of the art standards. One action that we recommend including in the plan is for The Office of Innovation and The Future to lead in crafting policy and standards for biochar that are in line with those adopted by the european biochar commission - these standards recognize 4 different grades of biochar based on the quality of the feedstock and the process. Testing and state-of -the-art regulatory standards are critical as poor quality biochar can contain heavy metals and other contaminants. The highest quality biochar is suitable for animal feed and agriculture. Lower grades of biochar are suitable for concrete etc. Below is the link to the EBC website and a copy of the UM flyer is attached.

https://www.european-biochar.org/en

Please let me know if you have any questions or if you would like to visit our facility.

Best,

Fred Horton

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THE UNIVERSITY OF MAINE
College of Earth, Life, and Health Sciences

# 2023-2024 Project:

Biochar amendment stabilizes the Per- and Polyfluoro alkyl substances (PFAS) in soils and reduces their uptake by crops


**Research team:**
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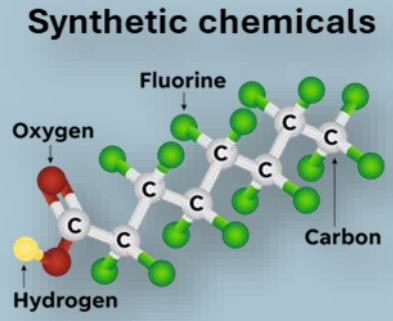
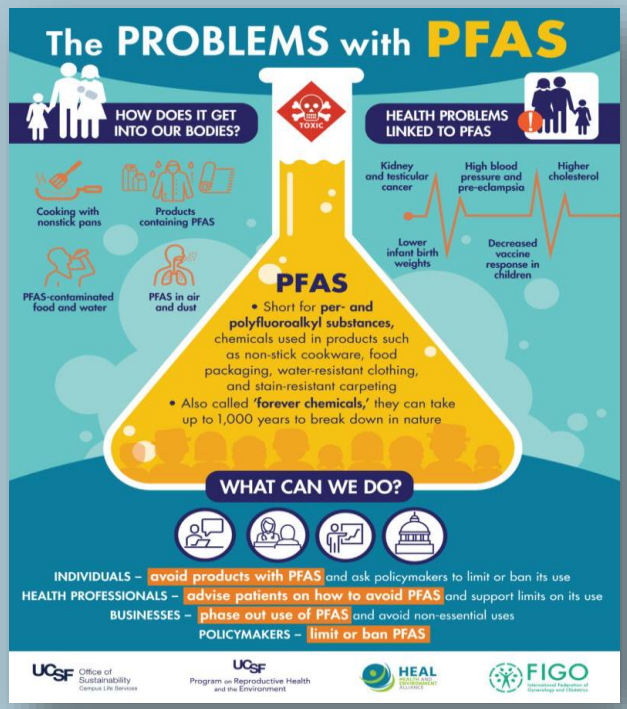
Kylie Holt, Lab manager of Agroecology lab
Julian LaScala (undergraduate student, SBE)
Cheryl Spencer, MAFES Director's technician




***PFOA**: Perfluoro octanoic acid, long-chain (listed as hazardous substance by EPA)*
***PFOS**: Perfluoro octane sulfonate, long-chain (listed as hazardous substance by EPA)*
***PFBA**: Perfluoro butanoic acid, short-chain*
***PFBS**: Perfluoro butane sulfonate, short-chain*

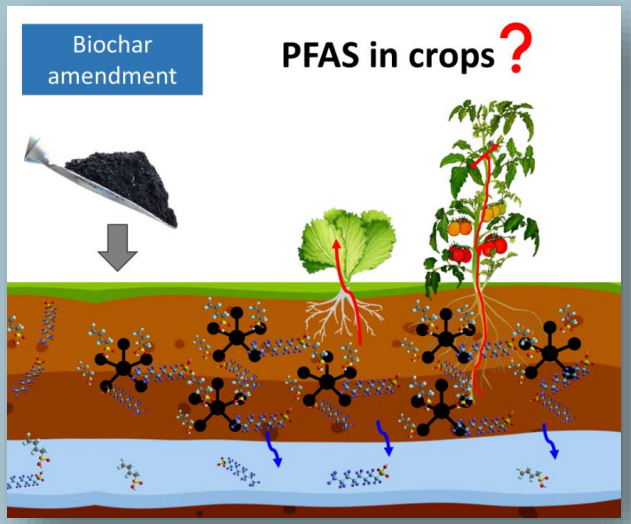



## Background

- Global soil loadings of PFOA and PFOS are 1,860 metric tons and over 7,000 metric tons (a survey in 2012);
- Many farms in Maine have been impacted by PFAS, resulting in a halt in farming activities;
- We seek affordable and efficient mitigation methods that can help farmers resume normal activities and ensure food security.

## Project Goal

Investigate the effectiveness and efficiency of biochar as a PFAS sorbent material in soils to reduce the PFAS uptake by crops (tomato and lettuce) by conducting a greenhouse study and a field study.



## Greenhouse Study at UMaine

- 220 ppb (ug/kg) of PFOA, PFOS, PFBA, and PFBS were individually spiked in PFAS-free soil;
- Biochar was added to PFAS spiked soil at a rate of 3:7 by volume;
- Leachate samples, lettuce leaves, and tomato fruits were collected to test PFAS types and levels.

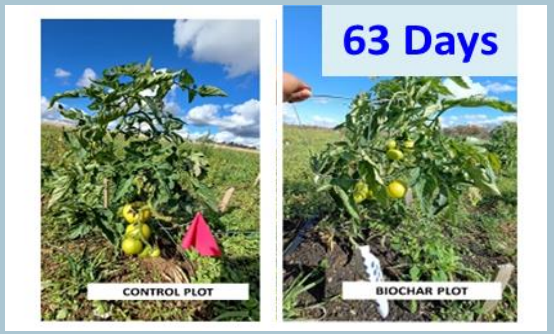
## Field Study at Hunter Farm

- Field site has more than 10 types of PFAS, PFAS precursors, and high in-field variation, e.g., 0.5 ppb to 90 ppb.
- Biochar was blended in the soil at a rate of 3:7 by volume.
- Lettuce leaves and tomato fruits were collected to test PFAS types and levels.

**Lettuce (*Lactuca sativa*)**


**Control** **Biochar**

**Tomato (*Solanum lycopersicum*)**




**Control** **Biochar**

## Major Takeaways

**Biochar effect:**

- Significantly **LOWER** concentrations of PFAS in leachate, lettuce leaves, and tomato fruits sampled from the biochar treated soil.

**Crop type effect:**

- **LOWER** PFAS concentrations in tomato fruits than in lettuce leaves.

**PFAS type effect:**

- **LOWER** concentrations or **NON-detection of** long-chain PFAS (PFOA and PFOS) compared to short-chain PFAS (PFBA and PFBS) in lettuce leaves and tomato fruits.

## Challenges & Future Work

- In-field variations in PFAS levels and types, along with the presence of PFAS precursors, complicate the analysis.
- Large-scale and long-term effects of biochar binding PFAS in soils and PFAS uptake by crops need to be assessed.
- Techno-economic assessment of applying biochar in PFAS-contaminated soils to mitigate the PFAS bioaccumulation in crops needs to be assessed.
- We need relevant regulations or guidelines on the limits of PFAS levels in food to guide the PFAS remediation research on crops.

# Guidelines

## European Biochar Certificate

## for a sustainable production of biochar

Version 10.3E of 5th April 2023

Please cite as:

EBC (2012-2023) 'European Biochar Certificate - Guidelines for a Sustainable Production of Biochar.' Carbon Standards International (CSI), Frick, Switzerland. (http://european-biochar.org). Version 10.3 from 5th Apr 2022

Impressum

These guidelines are effective since 1st January 2012 and constitute the basis for biochar certification in Europe and throughout the world. The EBC standard is developed by the Ithaka Institute and is own by Carbon Standards International.

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Thomas Bucheli, Agroscope, Zurich, Switzerland
Claudia Kammann, University of Geisenheim, Germany
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Gerhard Soja, AIT & University of Natural Resources and Life Sciences, Vienna, Austria
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# Table of contents

# A. Summary of the EBC to prepare the inspection

Companies that do not produce but process and trade certified biochar should consult Chapter 11 directly.

## 1. Inscription

1.1 Producers of biochar register on the EBC website (https://www.european-biochar.org/en/registration). The producer will then receive their login to the secured EBC website where they are requested to provide all necessary information about the company and the pyrolysis technology they use.

1.2 Following a first verification of the technical information and a personal phone contact with the producer through the Carbon Standards International, the company information are transmitted to the accredited inspection and certification body: bio.inspecta AG (https://www.bio-inspecta.ch/en/services.html).

1.3 The producer will receive an offer and contract for the EBC certification from bio.inspecta AG.

1.4 Once the producer has signed the inspection contract, Carbon Standards International will coordinate an appointment for a technical pre-audit with the biochar producing company which is usually done via a video conferencing system.

1.5 During the technical pre-audit, a company-specific quality assurance and sampling plan will be prepared and noted in the technical EBC inspection sheets. In addition, instruction is given in regard to the EBC methodology and the protocols to be kept for the annual inspection by bio.inspecta AG.

1.6 The company to be certified appoints a quality manager who will be the direct contact person for the inspection body, bio.inspecta AG, who will handle the entire certification process.

## 2. Production batch

2.1 A production batch starts with its registration on the EBC website. The production batch receives a unique ID number and QR code.

2.2 A production batch lasts a maximum of 365 days including all possible interruptions in production.

2.3 The pyrolysis temperature in °C shall not change by more than 20% during production. At a declared pyrolysis temperature of, for example, 600 °C, short-term fluctuations between 480 °C and 720 °C are thus permitted.

2.4 The composition of the biomass must not change by more than 20%. If, for example, a mixture of 50% grain husks and 50% landscape conservation wood is pyrolyzed, the proportions may vary in the range 40% to 60% (±(50% x 20%) = ±10%).

2.5 If a biochar producer registers for the first time a biochar production batch, a representative sampling has to be carried out by an accredited sampler within the first two months after registration.

2.6 After a production batch has expired, a subsequent, new production batch must be registered on the EBC website.

2.7 If the new production batch is produced with the same parameters as the preceding batch, the analysis of the preceding batch is valid until a sample of the new batch is taken and analysed.

2.8 The sampling of a new batch following a production batch produced with the same parameters should be done within a year after the last sampling and analysis. Sample taking should be finalized during the inspection visit.

2.9 A pyrolysis plant can produce several batches during the reference time of one year if feedstock and/or production conditions are changed. The interruption of one batch must be registered before starting or restarting another batch with its own ID and it must be declared if the batch shall be ended or is to be continued.

## 3. Sampling and sending the sample for analysis

3.1 The representative sample of a production batch is taken during the initial audit and thereafter during each annual inspection by an accredited sampler in accordance with the sampling plan contractually specified in the initial audit and sent to an EBC-accredited laboratory.

3.2 A sampling plan on how to take the representative samples must be submitted to and approved by Carbon Standards International.

3.3 The sampler is either the same person as the controller sent by the inspection body bio.inspecta AG or a company internal or external sampler who participated successfully in the official EBC sampling training.

3.4 The sample has to be registered on the EBC website, where the sample ID and the laboratory order for the EBC analysis are generated.

3.5 The sealed sample has to be sent with the EBC sample ID and the order for analysis to the selected EBC-accredited laboratory.

3.6 In accordance with the sampling and quality assurance plan specified in the contract, the production company shall ensure the sampling and sealed storage (usually daily) of the retained samples.

## 4. Permissible biomass for the production of biochar

4.1 All biomasses included in the EBC positive list may be used individually or in combination as feedstock for the production of EBC biochar. For each certification class certain restrictions apply, which are set out in the EBC positive list. For example, not all biomasses that may be

used for EBC-Urban may be used for EBC-Feed. Within a batch, the type of biomass may not be changed, and the mixing ratios may not change by more than 20% (cf. 2.5).

4.2 Mineral additives according to the EBC positive list may be added up to 10% of the mass. No mineral additives are permitted for EBC-Feed.

## 5. Specifications for pyrolysis technology

5.1 The use of excess heat or the use of liquid and gaseous pyrolysis products must be ensured.
5.2 Nationally defined emission limit values must be complied with.

## 6. Properties of biochar

6.1 The biochar for all application classes must be analysed at least according to the EBC Basic Analysis Package. For EBC-Feed the analyses of the EBC-Feed package are additionally required.
6.2 The following limit values and declaration requirements must be observed:

| EBC -Certification Class | | EBC-FeedPlus | EBC-Feed | EBC-AgroOrganic | EBC-Agro | EBC-Urban | EBC-ConsumerMaterials | EBC-BasicMaterials |
|---|---|---|---|---|---|---|---|---|
| **Elemental analysis** | Declaration of Ctot, Corg, H, N, O, S, ash | | | | | | | |
| | H / Corg | < 0.4 | | < 0.7 | | | | |
| **Physical parameters** | Water content, dry matter (as received and @ < 3mm particle size), bulk density (DM), WHC, pH, salt content, electrical conductivity of the solid biochar | | | | | | | |
| **TGA** | Needs to be presented for the first production batch of a pyroylsis unit | | | | | | | |
| **Nutrients** | Declaration of N, P, K, Mg, Ca, Fe | | | | | | | |
| **Heavy metals** | Pb | 10 g $t^{-1}$ (88%DM) | 10 g $t^{-1}$ (88%DM) | 45 g $t^{-1}$ DM | 120 g $t^{-1}$ DM | 120 g $t^{-1}$ DM | 120 g $t^{-1}$ DM | *declaration, no limit values for certification* |
| | Cd | 0.8 g $t^{-1}$ (88% DM) | 0.8 g $t^{-1}$ (88% DM) | 0.7 g $t^{-1}$ DM | 1,5 g $t^{-1}$ DM | 1,5 g $t^{-1}$ DM | 1,5 g $t^{-1}$ DM | |
| | Cu | 70 g $t^{-1}$DM | 70 g $t^{-1}$DM | 70 g $t^{-1}$DM | 100 g $t^{-1}$ DM | 100 g $t^{-1}$ DM | 100 g $t^{-1}$ DM | |
| | Ni | 25 g $t^{-1}$ DM | 25 g $t^{-1}$ DM | 25 g $t^{-1}$ DM | 50 g $t^{-1}$ DM | 50 g $t^{-1}$ DM | 50 g $t^{-1}$ DM | |
| | Hg | 0.1 g $t^{-1}$ (88% DM) | 0.1 g $t^{-1}$ (88% DM) | 0.4 g $t^{-1}$ DM | 1 g $t^{-1}$ DM | 1 g $t^{-1}$ DM | 1 g $t^{-1}$ DM | |
| | Zn | 200 g $t^{-1}$ DM | 200 g $t^{-1}$ DM | 200 g $t^{-1}$ DM | 400 g $t^{-1}$ DM | 400 g $t^{-1}$ DM | 400 g $t^{-1}$ DM | |
| | Cr | 70 g $t^{-1}$ DM | 70 g $t^{-1}$ DM | 70 g $t^{-1}$ DM | 90 g $t^{-1}$ DM | 90 g $t^{-1}$ DM | 90 g $t^{-1}$ DM | |
| | As | 2 g $t^{-1}$ (88% DM) | 2 g $t^{-1}$ (88% DM) | 13 g $t^{-1}$ DM | 13 g $t^{-1}$ DM | 13 g $t^{-1}$ DM | 13 g $t^{-1}$ DM | |
| **Organic contaminents** | 16 EPA PAH | 6±2.4 g $t^{-1}$ DM | CSI-declaration | 6±2.4 g $t^{-1}$ DM | 6.0+2.4 g $t^{-1}$ DM | CSI-declaration | CSI-declaration | CSI-declaration |
| | 8 EFSA PAH | 1.0 g $t^{-1}$ DM | | | | | | 4 g $t^{-1}$ DM |
| | benzo[e]pyrene benzo[j]fluoran-thene | < 1.0 g $t^{-1}$ DM for each of both substances | | | | | | |
| | PCB, PCDD/F | See chapter 10 | | Once per pyrolysis unit for the first production batch. For PCB: 0.2 mg $kg^{-1}$ DM, for PCDD/F: 20 ng $kg^{-1}$ (I-TEQ OMS), respectively | | | | |

* medical and health care products are not included

Tab.1 Overview of the most important analytical parameters for EBC biochar

6.3 Specifications, additional limit values, or more stringent limit values that apply only to certain countries are regulated in the respective country annex.
6.4 The biochar of the classes EBC-FeedPlus, EBC-Feed, EBC-Agro, EBC-AgroOrganic and EBC-Urban must be adjusted to a water content that prevents dust formation and thus also spontaneous combustion (30% is recommended). Biochar of the classes EBC-ConsumerMaterials and EBC-BasicMaterials can only be sold with a lower water content if the appropriate safety precautions, especially with regard to explosion and health protection, have been taken and the biochar is sold exclusively to business customers (B2B) with appropriate safety precautions.

## 7. Health and safety

7.1 A safety data sheet must be available.
7.2 The workers must sign that they have been informed about possible dangers at the workplace, read the data safety sheet, and that they have the necessary personal protective equipment.

# 1. Objective of the guidelines and certification

For thousands of years, charcoal has been one of civilisation's basic materials. By far the most common use of charcoal was for cooking, for heating and for smouldering when producing metal tools. However, for centuries charcoal and biochar have also been used for conditioning soils, or as litter (bedding) materials, as medicine and also as a feed additive. Over the course of the last century most of this traditional knowledge has been lost yet is being rediscovered since 2010.

Thanks to wide-ranging multidisciplinary research and field trials, the understanding of the biological and physico-chemical processes involved in the production and use of biochar has made great progress. A significant increase in the agricultural use of biochar has already been recorded since 2015. From 2020 onwards, a further acceleration in both agricultural and industrial use of biochar occurred. Agricultural applications range from soil conditioners, composting additives, and carriers for fertilisers to manure treatment and stable bedding, silage additives and feed additives. Industrial applications are particularly relevant to the construction, plastics, paper, and textile industries.

Traditional kiln production of charcoal and biochar without the combustion of pyrolytic gases is unsatisfactory with regards to its carbon efficiency and its overall environmental footprint. Accordingly, those kilns are unsuitable for the production of larger amounts of biochar to be used in agriculture or industry. Modern pyrolysis plants as well as certain types of farmer-scale kilns such as flame curtain pyrolysis systems are now ready to produce biochar from a large variety of different feedstocks in an energy efficient way and without harming the environment. As both biochar properties and the environmental footprint of its production are largely dependent on the pyrolysis parameters and the type of feedstocks to be used, a secure control and assessment system for its production and analysis had to be introduced.

In issuing these guidelines Carbon Standards International presents an assessment mechanism based on the latest research, practices, and legislation. By requiring the use of this assessment system, the European Biochar Certificate (EBC) will enable and guarantee sustainable biochar production, processing and sale. It is introduced to provide customers with a reliable quality standard, while giving producers the opportunity to prove that their products meet well-defined and recognized quality standards. It further aims to provide a firm state-of-the-art knowledge transfer as a sound basis for future legislation (e.g., EU fertilizer regulations or carbon-sink regulations).

Biochar technology continues to develop very rapidly. Numerous research projects around the world are investigating the properties of biochar and their interaction with other substances, materials, and the environment. Every year sees new manufacturers of pyrolysis equipment entering the market and the areas in which biochar and biochar products are used is growing rapidly. The European Biochar Certificate is closely aligned with this research and technical momentum and will accordingly be revised regularly to consider the latest findings and developments. Limit values and test methods will be adapted to reflect the latest findings and amended or updated as necessary.

The goal of these guidelines is to encourage and ensure the control of biochar production and quality based on well-researched, legally backed-up, economically viable and practically applicable processes. Users of biochar and biochar-based products will benefit from transparent and verifiable monitoring and quality assurance. It is our moral obligation as well as the duty of every biochar user's duty to make sure that a good idea is not be corrupted. The certificate was designed to serve this goal.

Currently, the European Biochar Certificate is a voluntary industry standard in Europe. In Switzerland, however, it is obligatory for all biochar sold for use in agriculture. Several other countries aligned their biochar related regulations with the EBC.

# 2. Definition of biochar

**Biochar is a porous, carbonaceous material that is produced by pyrolysis of biomass and is applied in such a way that the contained carbon remains stored as a long-term C sink or replaces fossil carbon in industrial manufacturing. It is not made to be burnt for energy generation.**

Biochar is produced by biomass pyrolysis; a process whereby organic substances are broken down at temperatures ranging from 350°C to 1000 °C in a low-oxygen process. Although torrefaction, hydrothermal carbonisation and coke production are carbonisation processes, the end products cannot however be called biochar under the above definition. Biochars are therefore specific pyrolysis chars characterised by their additional environmentally sustainable production, quality and usage features. Gasification is understood as being part of the pyrolysis technology spectrum and can, if optimized for biochar production, be equally certified under the EBC.

Biochar is defined by its quality characteristics, by the raw materials used, its sustainable production and end use.

Biochar is a hyper versatile material with an increasing number of applications in agriculture, environmental engineering, and basic industry. Each application, like the use as a soil amendment, stormwater filter, or additive for building materials, textiles, and plastics, demands specific biochar qualities. Thus, each application requires proper certification parameters that must be specified, controlled, and guaranteed.

# 3. The EBC certification classes

To keep pace with the growing number of biochar uses, the EBC has introduced a number of certification classes. According to the requirements and safety regulations of the different applications, different parameters are controlled, and limit values apply. With the publication of EBC v10.0, the certification class EBC-BasicMaterials is introduced as the basic and fundamental certification class. It defines what can be considered a biochar or not according to the EBC and complies with all requirements of the EU-REACH regulation [1]. All present and future certification classes meet at least the requirements of EBC-BasicMaterials and thus meet all requirements of the EU-REACH regulation, too. All EBC-certification classes are entitled for C-sink certification.

The definition of a certification class (e.g., EBC-Urban or EBC-ConsumerMaterials) is a statement of admissibility of biochar for a given purpose regarding applicable laws, regulations, and relevant industry standards. The assignment to a certification class is not a statement about the excellence of biochar (i.e., good, better, or best biochars for a specific purpose/use) – but it does distinguish between biochars that are admissible or inadmissible for a defined form of application (e.g., in agriculture or construction). Each application and thus certification class has its specific requirements.

When selling to end-user (B2C), every biochar and biochar-based product must be labelled according to the EBC certification class under which it is traded. If, e.g., a biochar is sold as a building material it must be labelled as EBC-BasicMaterial. An EBC-Agro labelled biochar cannot be traded as building material. A biochar labeled as EBC-Feed cannot be sold as a soil amendment. A packaging unit for end users must not be labelled with more than one certification class.

When sold to other businesses (B2B) that process or trade biochar, the biochar may be labeled with multiple certification classes. For example, biochar can be certified with EBC-FutterPlus, EBC-Agro, EBC-ConsumerMaterials and EBC-BasicMaterials and sold to other companies (B2B) carrying these different certification classes. An EBC-certified biochar processor can then label its products according to the applicable certification classes for end users. It is thus possible to market different products, each with a different certification class, to end users from a biochar supply that was delivered with multiple certification classes. If a biochar qualifies for different certification classes, different packaging units from one and the same production batch can be sold under different EBC-labels.

While EBC-FeedPlus certified biochar meets all requirements of all other certification classes, a general "downward compatibility" is not given within the EBC. This is also not intended since the demands on biochar properties vary greatly depending on the field of application and can

also be contradictory in some cases. This will become even more pronounced with the increasing professionalization of biochar product design and the progress of research and development.

**EBC-FeedPlus** meets all EU and EFTA regulations relevant for animal feeding and agricultural soil applications [2,3].It can be used for all livestock operations and also be applied to soil. Biochar with **EBC-Feed** certification meets equally all requirements of the EU feed regulation [2] but not those of the EU fertilizer product regulation [3] which are partly stricter than the EU feed regulations. Still, risks for animals are low. Hence, **EBC-Feed biochar may be used for animal feeding but must not be used for amending agricultural soils according to current EU-fertilizer regulations** (c.f. chapter 7.12). In addition to the EBC-FeedPlus or EBC-Feed certification, a biochar producer must be approved as a feed producer in accordance with the respective national requirements.

Biochars certified with **EBC-Agro** and **EBC-AgroOrganic** meet all requirements of the new EU fertilizer product regulation [3]. Several EU countries such as Austria, Sweden, and Hungary have approved the use of biochar according to the requirements of EBC-Agro. Based on these national approvals, such biochars can be exported and used in all other EU countries. Several EU and EFTA countries apply their own restrictions for the agricultural use of biochar. Switzerland, for example, requires the certification according to EBC-AgroOrganic, have lower Σ16 EPA PAHs thresholds, and only allow woody biomass as a feedstock for pyrolysis (see Swiss Annex). Germany currently requires a minimum carbon content of 80% for biochar that must be produced from untreated wood. Sweden has defined limits beyond the EU regulation and EBC-Agro, which are covered by the Sweden Annex of the EBC. The EBC-AgroOrganic certificate meets all requirements of the EU Commission regulation on organic production [4]. The respective specifications and limit values are continuously adapted to align with the ongoing development of relevant European legislation and scientific advances.

**EBC-Urban** provides a strong standard for the use of biochar in tree planting, park maintenance, sidewalk embellishments, ornamental plants, and rainwater drainage and filtration. The main risk of all those uses is ground- and surface water contamination and work safety, which EBC-Urban certification prevents effectively. As the urban use of biochar is not subject to agricultural legislation, some parameters, and their respective limit values were replaced by limit values that are better adapted to the special matrix of biochar. For example, the EBC-Urban limit value for PAHs is limited to the eight carcinogenic PAHs. PAHs are ubiquitous in urban environments (e.g., from tyre abrasion and car exhaust), and urban soil applied biochar which is a strong adsorber of PAHs will act as a net adsorber of those environmental toxins when low biochar PAH-contents are guaranteed (as is the case when EBC-Urban biochar is used).

Biochar certified under **EBC-Urban** must not be used as soil amendment for food or feed production. If biochar shall be used in urban community gardens or home-gardening projects,

EBC-Agro or EBC-AgroOrganic quality is recommended. EBC-Urban can further be used for remediation of polluted soils, sediments or groundwater, the production of ornamental plants, and tree nurseries for non-food species. EBC-Agro and EBC-AgroOrganic fulfill all requirements of EBC-Urban and can be used for any urban soil applications.

The certification classes **EBC-ConsumerMaterials** and **EBC-BasicMaterials** cover all necessary environmental requirements for non-soil applications.

**EBC-ConsumerMaterials is** destined for biochar to be used in products that may come into direct skin contact with consumers or food-grade products. Examples would be takeaway coffee cups, plastic computer cases, toothbrushes, carpets, textiles, flowerpots, freshwater pipes, etc. However, this does not include medical and healthcare products or food. The biochar must be included in the consumer products in such a way that no coal dust is released because of product use.

The **EBC-BasicMaterials** certificate guarantees sustainably produced biochar, which can be used in basic industry such as to produce building materials, road construction asphalt, electronics, sewage drains, and composite materials like skis, boats, cars, rockets without risk to the environment and users. However, precautions in handling, storing, and labeling the materials are required, as described in the dedicated sections of the EBC (see chapter 11).

Both EBC-ConsumerMaterials and EBC-BasicMaterials must not be used in agriculture or other soil applications such as planting urban trees, remediating polluted areas, or mine reclamation. EBC-BasicMaterials must not be sold directly to private customers (B2C) but is traded exclusively to other businesses (B2B) where adequate handling (i.e., avoidance of dust generation, respiratory protection, avoidance of skin contact) can be ensured.

EBC-**BasicMaterials** defines what can be considered "biochar" and used as a sustainable raw material. Other solid residues obtained from pyrolysis or gasification of biomass that exceed EBC-BasicMaterials limit values must be considered as (potentially) toxic waste and must be disposed of as waste material according to local, national, or international laws. Pyrolytic products from feedstock that are not listed on the EBC feedstock positive list (e.g., industrial wastes or fossil carbon like lignite) should not be considered biochar and must not be traded under the EBC label.

For all certification classes, the same sustainability criteria regarding the production of biochar (i.e., emissions, feedstock storage, the definition of batches, control of pyrolysis parameters), sampling, and on-site inspection do apply.

Specific industry classes defining biochar qualities for the use in construction materials, polymers, textiles, and other materials will be developed from 2023 onwards depending on the demand from the respective industries.

If European biochar producers are interested in having new certification classes included into the EBC, a formal application should be sent to the Carbon Standards International

(standards@carbon-standards.com). The EBC Scientific Committee will review the application in detail and either add the certification class or publish the reasons for the refusal or deferment.

# 4. Biomass feedstock

4.1 Only biomass and no fossil carbon may be used to produce biochar. The EBC positive list (Appendix 1) indicates which types of biomasses are permissible for each application class.

4.2 Deliberately mixed feedstock containing fossil carbon or products made using fossil carbon and biomass may be authorized for EBC-BasicMaterial if proper organic and fossil carbon tracking is provided. Using such mixed fossil–organic carbon feedstock needs the written approval of Carbon Standards International.

4.3 The clean separation of non-organic substances such as metals, construction waste, electronic scrap, etc. must be guaranteed.

4.4 To produce biochar for soil and agriculture (EBC-FeedPlus, EBC-Feed, EBC-Agro, EBC-AgroOrganic, EBC-Urban), the biomass used must not contain any paint residues, solvents or other potentially toxic impurities.

4.5 To produce EBC-FeedPlus, EBC-Feed, EBC-Agro, EBC-AgroOrganic, and EBC-Urban qualities, unavoidable contamination of the biomass by plastic and rubber waste must not exceed 1% (m/m). To produce biochar for materials (EBC-ConsumerMaterial, EBC-BasicMaterials) plastic and rubber contents of up to 10% can be accepted, though these are subject to declaration and require the written approval of Carbon Standards International. In the latter case, Carbon Standards International may define additional requirements for the pyrolysis process, request additional analyses to ensure the safety of the product and its application, and deduce plastic derived carbon from the C-sink potential of the biochar. Based on ongoing research showing the complete elimination of plastic feedstock under defined pyrolysis conditions, higher limit values for feedstock plastic contamination may be introduced in 2024.

4.6 When using primary agricultural products (e.g., miscanthus or short rotation forestry), it must be guaranteed that these were grown in a sustainable manner and that the soil organic carbon was preserved.

4.7 Biochar may only be produced from forest wood if sustainable management of the corresponding forest can be proven by PEFC or FSC certificates or by comparable regional standards or laws.

4.8 The pyrolysis of animal by-products, such as livestock manure and manure containing biogas digestates is authorized as feedstock for all certification classes except EBC-FeedPlus and EBC-Feed. Pyrolysis conditions must exceed 500 °C for 3 min at minimum to eliminate biological hazards and micropollutants. Its use for industrial materials should be avoided to preserve the valuable plant nutrient from the manures. To avoid health risks for workers during the handling of the animal by-products, a treatment plan for the animal by-

products from the arrival at the production site till the pyrolysis must be provided and authorized by Carbon Standards International.

4.9 Biosolids may be used as feedstock to produce EBC-BasicMaterial provided that health risks for workers during the handling of the biosolids are prevented. A treatment plan for the biosolids from the arrival at the production site till the pyrolysis must be provided and authorized by Carbon Standards International. Pyrolysis conditions must exceed 500 °C for 3 min at minimum to eliminate biological hazards and micropollutants.

Unfortunately, the heavy metal contents of most biosolids are usually too high for EBC-Agro and EBC-Urban and, thus, for soil application. Some countries adopted fertilizer or waste management ordinances based on nutrient-to-heavy-metal ratios rather than total heavy-metal content to regulate soil application and allow pyrolysis to treat biosolids, e.g., Denmark. Based on the respective country annex, pyrolyzed biosolids may be certified for soil application in those countries but not yet in other countries where the EBC applies.

4.10 Mineral additives such as rock powder and ashes, as detailed in the EBC positive list (Appendix 1), which may be used to control the quality of biochar, are subject to declaration and require written approval from the EBC. Carbon Standards International may request additional quality controls with regard to organic and inorganic contaminants. To produce EBC-Feed, no mineral additives are admitted yet.

4.11 Complete records of the processed biomasses and additives must be kept and archived for at least five years.

If biochar producers are interested in adding new biomass or mineral additive materials on the EBC-feedstock list, a formal application should be sent to Carbon Standards International. The EBC Scientific Committee will review the application in detail and either add the feedstock or publish the reasons for the refusal. The EBC is prepared to add national appendixes to align the general EBC certification with national laws regarding eligible feedstock.

# 5. Definition of biochar batches and their registration

A biochar production batch is defined as:

5.1 Each production batch has to be registered on the EBC website. The EBC will allocate a unique ID number with corresponding QR code for the production batch. The ID number and the QR code ensure the traceability of the biomass feedstock, the conditions of production, and the quality of the biochar.

5.2 A production batch lasts a maximum of one calendar year including all possible interruptions in production.

5.3 The pyrolysis temperature in °C must not change by more than 20 % during production. With a declared pyrolysis temperature of, for example, 600 °C, short-term fluctuations between 480 °C and 720 °C are thus permitted. Documented production interruptions, both planned and unplanned, are permitted provided that the specified temperature range is maintained after resuming the production. Depending on the pyrolysis process, biochar from the plant start-up and shut-down process may need to be carefully separated and documented and must not be marketed as EBC-FeedPlus, EBC-Feed, EBC-AgroOrganic, or EBC-Agro. The precise handling of biochar from the start-up and shut-down process is regulated during the technical audit and documented in the online instruction manual.

5.4 The blend of different types of biomass listed in the EBC positive list may not change by more than 20 percentage points. For example, if a mixture of 50% cereal husks and 50% landscape conservation wood is pyrolyzed, the proportions may vary in the range 40% to 60% [±(50% x 20%) = ±10%].

5.5 If a biochar producer registers for the first time a biochar production batch, a representative sampling has to be carried out by an accredited sampler within the first two months after registration.

5.6 After a production batch has expired, a subsequent, new production batch must be registered on the EBC website.

5.7 If the new production batch is produced with the same parameters as the preceding batch, the analysis of the preceding batch is valid until a sample of the new batch is taken and analysed.

5.8 The sampling of a new batch following a production batch produced with the same parameters should be done within a year after the last sampling and analysis. Sample taking should be finalized during the inspection visit.

5.9 Complete production records must be kept, providing detailed descriptions and dates of any production problems or stoppages. Furthermore, the daily taking of the retention sample must be recorded (see chapter 6.3 retention sample).

5.10 The daily production quantities of biochar must be documented.

5.11 On the last production day of a batch, the date and time of the end of the biochar production batch and the total production quantity of the complete biochar batch have to be reported on the EBC website.

5.12 A pyrolysis plant can produce several batches during the reference time of one year if feedstock and/or production conditions are changed. The interruption of one batch must be registered before starting or restarting another batch with its own ID and it must be declared if the batch shall be ended or is to be continued.

A batch may be restarted after producing one or several other batches in between. Still, the batch must end eventually the latest 365 calendar days after the first start (cf. 2.2.).

As soon as either point 5.3 or point 5.4 are no longer fulfilled, a production batch is considered completed. A new production batch with the changed parameters must be registered on the EBC website and an appointment with an accredited sampler must be arranged. The annual inspection visit takes place once per calendar year, irrespective of the number of batches produced.

# 6. Biochar sampling

## 6.1 Representative sample

Since 2021, the biochar samples sent to the accredited laboratory for EBC analysis must be taken by an accredited sampler. The sampling plan is drawn up during the initial audit and has to be approved by Carbon Standard International and is documented in the online instruction manual (chapter 13.5). The accredited sampler must follow the company-specific sampling plan.

The accredited controlling inspector of q.inspecta is entitled to take additional samples at any time and send them to the accredited laboratory or to Carbon Standard International.

Once per year, Carbon Standard International organizes the training and accreditation of biochar sampler. Biochar producing companies can send their quality manager to the EBC sample taking training and if they obtain the accreditation, they are entitled to take the representative samples following the CSI approved sampling plan.

## 6.2 Sending of the representative biochar sample to the accredited laboratory

The representative samples for analysis must be sealed by the accredited sampler and registered on the EBC website before shipping the sample. The producer sends the sealed sample to the EBC-accredited laboratory selected by the producing company.

6.2.1 The accredited laboratory shall send the results of the analysis to the biochar producing company and a copy to the accredited inspection body, Carbon Standard International and the Ithaka Institute.

6.2.2 The Carbon Standard International and the Ithaka Institute have the right to use the results of EBC analyses in anonymised form for statistical and scientific purposes.

### 6.3 Retention Sampling

In addition to the EBC analysis sample, the manufacturer is obliged to take regularly (in general every day) retention samples. The exact procedure is determined during the initial audit. If no deviating protocol is determined during the initial audit, the following applies:

Daily, a fresh sample of one liter, either from the cross-flow or from the collected daily production has to be taken. The cross-flow sample can be taken both manually and automatically from the daily production [5].

The daily sampling time has to be entered in the production record. The daily samples must be collected for one month at a time in a sample container as a composite 30-liter sample. After one month the composite sample shall be sealed. The next 30 cross-flow samples shall be collected in a new sample container until this container is also sealed and stored.

**The monthly retention sample of at least 30 liter must be kept dry and protected for two years.** The retained samples serve to protect the producer who will thus be able to prove in the event of any complaints from authorities or customers that the relevant biochar was free of pollutants and that it was of the quality guaranteed by the EBC certificate.

During the initial audit, company-specific regulations for the creation and storage of reserve samples can be defined.

# 7. Biochar properties

The aim of the EBC certificate is to guarantee compliance with all environmentally relevant limit values and to declare those biochar properties which are relevant for the respective application class and that can be analyzed at reasonable cost.

There are numerous additional analytical possibilities to characterize and classify biochar even more comprehensively. However, many of these would go beyond reasonable cost limits. We do not seek to analyze, regulate and guarantee all possible parameters, but rather those that are necessary to ensure safety and sustainability.

The limit values mentioned in the following chapter are only valid in conjunction with the permissible test procedures and permissible analytical methods. These are detailed for the individual parameters in Appendices 1-3.

Additional or more stringent limit values that apply only to certain countries are regulated in the respective country annex (see Annex A5ff).

## 7.1 The biochar's organic carbon ($C_{org}$) content must be declared.

The organic carbon content of biochar varies between about 35 % and 95 % of dry matter, depending on the biomass feedstock and the pyrolysis temperature. For example, the carbon content of pyrolyzed straw is usually between 40 and 50% and that of wood and nutshells between 70 and 90%.

In previous versions of the EBC certificate, a limit value of 50% organic carbon content was applied to biochar. All pyrolysis products below this limit were considered as pyrogenic carbonaceous materials (PCM). However, a large number of scientific papers published in recent years have shown that a carbon content of > 50% is not a sufficient criterion for such a distinction. In particular, biochar from crop residues such as straw and grain husks have proven to be well suited for various agricultural and industrial applications, even though the carbon content is usually below 50%. Since the use of crop residues and other secondary plant biomasses is desirable both for climate protection and for closing nutrient cycles, the former limit of 50% has been reconsidered. The term PCM is not used anymore within the EBC.

## 7.2 The molar $H/C_{org}$ ratio must be less than 0.7 and less than 0.4 for EBC-FeedPlus and EBC-Feed

The molar $H/C_{org}$ ratio is an indicator of the degree of carbonisation and therefore of the biochar stability. The ratio is one of the most important characterising features of biochar and is indispensable for the determination of the C-sink value. Values fluctuate depending on the biomass and process used. Values exceeding 0.7 are an indication of non-pyrolytic chars or

pyrolysis deficiencies [6]. For EBC-FeedPlus and EBC-Feed, $H/C_{org}$ must be less than 0.4 (c.f. chapter 10). For EBC-Feed, biochars with H/Corg < 0.7 are still allowed during a transition period until Dec. 31, 2023 (latest possible end of a batch).

### 7.3 The molar $O/C_{org}$ ratio should be below 0.4

In addition to the $H/C_{org}$ ratio, the $O/C_{org}$ ratio is also relevant for characterising biochar and differentiating it from other carbonisation products [6]. Compared to the $H/C_{org}$ ratio, direct measuring of the O content is expensive and not standardized. Therefore, the calculation of the O content from C, H, N, S and ash content is accepted.

The $O/C_{org}$ ratio can sometimes exceed 0.4 due to post-pyrolytic treatment or by co-pyrolysis with oxidative or catalytically acting additives. In this case, the EBC would carry out a plausibility check and grant an appropriate exemption, provided that product quality and environmental protection are guaranteed.

### 7.4 Volatile Organic Compounds (VOC) are determined by thermogravimetric analysis (TGA).

During the pyrolysis process aromatic carbon, carbonates and a multitude of diverse volatile organic compounds are formed. The latter constitutes a large part of the pyrolysis gas that partially condensates on biochar surfaces and pores. These condensed pyrolysis gas compounds are substantial constituents of biochar materials [7,8], are essential for certain biochar functions and thus necessary for the characterisation of biochar.

However, a quantitative determination of VOCs cannot be carried out at reasonable cost.

For an independent estimation of the true pyrolysis temperature, which can deviate from the temperature measured at the reactor for various reasons, the weight loss of volatile compounds of biochar is determined by gradually increasing the temperature in the absence of air using the thermogravimetric analysis (TGA). The TGA diagram can thus be used to determine both the absolute VOC content and the maximum temperature to which the biochar was exposed during pyrolysis.

The total VOC content and its temperature-dependent degassing are considered as a criterion for the evaluation of the pyrolysis process. For this reason, it is considered sufficient that the TGA analysis need only be carried out in the first control year of a pyrolysis unit.

### 7.5 The biochar nutrient contents must be declared at least for nitrogen, phosphorus, potassium, magnesium, calcium, and iron.

The nutrient contents of different biochars depends on the feedstock selection and can account for up to a third of the total weight. It should be noted that these nutrients are only partially

available to plants due to covalent bonds (especially in the case of nitrogen) and/or the high adsorption capacity of the biochar and may only be reincorporated into the biological cycle over decades. The nutrient availability of the phosphorus found in biochar is for instance only about 15% in the first year, that of nitrogen a mere 1%, while availability of potassium can reach 50% [9].

For the use in agriculture and animal husbandry nutrient information is legally required. For material uses, the nutrient contents are generally less relevant, but depending on the application, they may influence certain material properties, especially with higher contents of calcium, potassium, and magnesium, which is why the declaration of the nutrient contents is also mandatory for both material certification classes.

### 7.6 The following limit values for heavy metals must not be exceeded

For EBC-Agro, the maximum values for heavy metal contents are based on the EU-Fertilising Products Regulation EU 2019/1009 [10], the German Federal Soil Protection Ordinance [11]; and for EBC-AgroOrganic on the EU regulations 2019/2164 on organic production, and the Swiss Ordinance on Risk Reduction related to Chemical Products (ChemRRV). By precautionary principle, EBC-Urban and EBC-ConsumerMaterials must meet the same heavy metal limit values as EBC-Agro. As biochar certified under EBC-BasicMaterials has to be included into material matrices from where the biochar cannot leach, no limit values for heavy metals apply.

As of 2022, silver is added to the list of heavy metals that must be quantified and the content of Ag must be declared. No limit value is applied. Additional parameters and methods apply to EBC-FeedPlus and EBC-Feed, which are described in Chapter 10.

*Tab. 2: Limit values for heavy metals according to the EBC application classes.*

| | EBC-FeedPlus / EBC-Feed | EBC-AgroBio | EBC-Agro / EBC-Urban / EBC-ConsumerMaterials | EBC-BasicMaterials |
|---|---|---|---|---|
| Pb | 10 g $t^{-1}$ (88%DM) | 45 g $t^{-1}$ DM | 120 g $t^{-1}$ DM | no limit value, only declaration required |
| Cd | 0.8 g $t^{-1}$ (88% DM) | 0.7 g $t^{-1}$ DM | 1,5 g $t^{-1}$ DM | |
| Cu | 70 g $t^{-1}$DM | 70 g $t^{-1}$DM | 100 g $t^{-1}$ DM | |
| Ni | 25 g $t^{-1}$ DM | 25 g $t^{-1}$ DM | 50 g $t^{-1}$ DM | |
| Hg | 0.1 g $t^{-1}$ (88% DM) | 0.4 g $t^{-1}$ DM | 1 g $t^{-1}$ DM | |
| Zn | 200 g $t^{-1}$ DM | 200 g $t^{-1}$ DM | 400 g $t^{-1}$ DM | |
| Cr | 70 g $t^{-1}$ DM | 70 g $t^{-1}$ DM | 90 g $t^{-1}$ DM | |
| As | 2 g $t^{-1}$ (88% DM) | 13 g $t^{-1}$ DM | 13 g $t^{-1}$ DM | |
| Ag | no limit value, only declaration required | | | |

Heavy metals are an essential component of all ecosystems. Even in natural soils that are hardly influenced by human activities, every plant absorbs more than 50 geogenic elements of the periodic table and amidst those there are all essential heavy metals. Heavy metals are only toxic

if their concentration is exceedingly high and they are bio-available, which is why the limit values listed in Table 2 have been defined for each type of application.

With the exception of a few heavy metals that are volatile or semi-volatile at the prevailing pyrolysis temperatures (e.g., mercury), the amount of heavy metals originally contained in the biomass is retained in the biochar. While the weight of the original biomass is reduced during pyrolysis by more than 50% due to the loss of carbon, hydrogen, and oxygen, heavy metals remain which leads to increased concentration, i.e., the heavy metal content in the biochar is higher than in the original biomass.

As long as the biomass was not grown on contaminated soils or has increased heavy metal contents due to plant treatments (e.g., copper spraying in viticulture) or due to contamination with wastes, the concentration effect from pyrolysis is not critical. Heavy metal contents beyond the limit values thus indicate above all the contamination of the biomass used and thus represent an additional control of the biomass quality.

In industrial applications, including the use of biochar in asphalt, concrete and composite materials, the risk of heavy metals being leached into the environment or harming users of these industrial materials is generally quite low. For this reason, EBC-BasicMaterials only requires the declaration of heavy metal contents but does not define limit values. We expect to set further application specific EBC limit values in the future. However, at the present stage of industrial development accurate, use-specific limits cannot yet be determined meaningfully by the EBC. It is incumbent upon industrial manufacturers that seek to incorporate biochar into their products to comply with the respective limit values pertinent to their industry. In addition, all industrial producers and users are urged to carefully consider end of the life handling of their industrial materials to prevent pollutants from entering the environment.

### 7.7 pH, salt content, bulk density, and water content must be declared.

The pH value of biochar is an important criterion for the targeted use in substrates as well as for the fixation of nutrients in animal husbandry as well as in industrial products. The salt content, measured via electrical conductivity of the biochar leachate, may indicate a contamination of the feedstock, and should therefore be measured. Bulk density (on dry matter base) and water content are necessary specifications for trading biochar as well as for the production of consistent substrate mixtures and materials requiring consistent carbon contents.

The biochar of the classes EBC-FeedPlus, EBC-Feed, EBC-Agro, EBC-AgroOrganic, and EBC-Urban must be adjusted to a water content that prevents dust formation and thus also spontaneous combustion (see also chapter 9.3). Appropriate storage must prevent the biochar from drying. EBC recommends a water content of 30% for this purpose. There are no guidelines regarding water content for EBC-ConsumerMaterials and EBC-BasicMaterials, which may only be traded B2B. However, if the biochar is sold with a water content of less than 30% or a water

content that cannot effectively prevent dust formation, the manufacturer and trader must indicate the associated hazards following relevant standards and local, national, and international requirements. This includes but may not be limited to spontaneous ignition, dust explosion, and the health hazards of inhaling (fine) dust. Appropriate safety precautions must be indicated.

### 7.8 The determination of the water holding capacity (WHC)

Water holding capacity (WHC) provides guidance for mixing biochar with liquids, e.g., liquid fertilizer, digestate, storm water management. It is also a valuable indication of its effectiveness in increasing a soil's water holding capacity and for humidity buffering when e.g., applied to the root zone. WHC may also help to evaluate the moisture absorption and buffering capacity of construction and other biochar-based materials.

### 7.9 Electrical conductivity of the solid biochar

The electrical conductivity of biochar is a highly important indirect parameter to compare batches and the homogeneity of biochar within a given batch. Moreover, it was shown that certain effects of biochar in soil, in the digestions system, in anaerobic digesters, in composting, and in certain composite and construction materials may be related to the electrical conductivity of the solid biochar. It should not be confounded with the electrical conductivity of the aqueous leachate of biochar, which is used to estimate the salt content.

### 7.10 Specific surface area and pore size distribution are recommended as additional parameters

The specific surface area according to BET is an important characterization and comparison criterion for the physical structure of biochar. It should be noted, however, that no method provides absolute values for the specific surface area, but only relative values which allows for standardized comparisons. The BET surface area is often over- and misinterpreted: The BET does not allow any statement about the colonization potential for microorganisms. A higher BET surface does not necessarily mean a higher potential for contaminant binding. For a more precise evaluation of the pore properties, at least data on pore size distribution would be required. Due to the costs, the measurement of specific surface area and pore size distribution are recommended as additional parameters but are not mandatory.

### 7.11 Limit values for PCB and PCDD/F must be observed

In modern pyrolysis plants, only minimal quantities of PCBs, polychlorinated dibenzo-p-dioxins and furans (PCDD/F) are produced [12]. For this reason, except for EBC-Feed, it is considered

sufficient that PCB and PCDD/F must only be quantified once in the first control year of a pyrolysis unit. These pollutant contents depend mainly on the chlorine content of the pyrolyzed biomass. All biomasses authorised on the positive list have a low chlorine content and only very low contents of these organic pollutants must be expected for the resulting biochar. If the control bodies of the EBC consider the risk of chlorine contamination of the source biomass to be relevant, additional PCB and PCDD/F analyses may be required. The limit values are based on the soil protection regulations in force in Germany and Switzerland [11,13].

The limit values for PCB are 0.2 mg $kg^{-1}$ (DM), and for PCDD/F they are 20 ng kg-1 (I-TEQ OMS), respectively.

### 7.12 Limit values for PAH contents must not be exceeded

| EBC -Certification Class | Certification Class | EBC-FeedPlus | EBC-Feed | EBC-Agro / EBC-AgroOrganic | EBC-Urban | EBC-ConsumerMaterials* | EBC-BasicMaterials |
|---|---|---|---|---|---|---|---|
| **Organic contaminents** | 16 EPA PAH | 6.0+2.4 g $t^{-1}$ DM | CSI-declaration | 6.0+2.4 g $t^{-1}$ DM | CSI-declaration | CSI-declaration | CSI-declaration |
| | 8 EFSA PAH | 1.0 g $t^{-1}$ DM | | | | | 4 g $t^{-1}$ DM |
| | benzo[e]pyrene benzo[j]fluoran-thene | < 1.0 g $t^{-1}$ DM for each of both substances | | | | | |

* medical and health care products are not included

The pyrolysis of organic materials causes the formation of polycyclic aromatic hydrocarbons (PAH) [14]. The PAH content of biochar depends primarily on the pyrolysis conditions like temperature and the separation of biochar and pyrolysis gases in the reactor and discharge [15,16]. Appropriate production technologies with both classical kilns and modern pyrolysis reactors can avoid undesired PAH-contamination of biochar, correct process control provided. The type of biomass feedstock used for biochar production has a negligible influence on the PAH content [17].

During biochar production, PAHs are usually released with the pyrolysis gases and are destroyed when these pyrolysis gases are combusted to produce thermal and electric energy. However, depending on the process conditions, a smaller or larger part of the released PAHs can be adsorbed by the simultaneously produced biochar. Moreover, if biochar is cooled down in the presence of PAH-containing pyrolysis gas, significant amounts of PAHs condensate on the biochar surfaces within the complex porous system. Thus, biochar and pyrolysis gas must be separated at temperatures that do not allow condensation and sorption of PAH on the biochar. Controlled vapor quenching may support avoidance of PAH accumulation.

In principle, biochar with a very low PAH content can be produced even by the simplest of means, as demonstrated by the Kon-Tiki flame curtain kiln [18]. However, some industrial pyrolysis and gasification technologies developed over the past decades resulted in biochars with elevated PAH

levels [19], which are an indication of unsatisfactory or unsuitable production conditions. The technical feasibility to produce biochar with very low PAH contents is demonstrated by all EBC-certified biochar companies and their technology suppliers since 2012.

Individual PAH differ widely in their toxicity [20]. The type and degree of toxicity (e.g., genotoxicity, carcinogenicity, ecotoxicity) depends on the molecular structure, the concentration, the bioavailability, the exposure route, and the temporal course of the exposure. The bioavailability of a PAH molecule is determined by the matrix to which the toxin is bound when exposed to humans, animals, or ecosystems.

As shown by Hilber et al. [21,22], biochar that is amended to soil acts more as sink than a source of PAHs. As PAHs are ubiquitous in agricultural and urban environments such as soil or the atmosphere, low-PAH-biochars that are used in soil adsorb more PAHs from the soil than they release into the soil. The high adsorption capacity distinguishes biochars from other amendments like compost, digestate, manure, and other fertilizers. The use of identical PAH limit values for low and high PAH-adsorbing materials can thus be questioned.

Biochar is not only a potent adsorber of PAHs [23] but also the bioavailability of biochar-bound PAHs is extremely low [21]. Compared to compost, digestate, fertilizer, atmospheric depositions, or hay which are all important entry points of PAHs into agronomic systems [24,25], PAH-bioavailability from biochar is most likely the lowest. The risks of bioavailable PAHs for plants, soil biota, animals, and humans are rather well known and investigated [20,26–28]; however, to our knowledge, only one initial investigation about the risks of exposure to biochar bound PAHs was published yet [29]. In the absence of a proper risk assessment, the precautionary principle led the regulators to apply for biochar the same limit values for PAH contents as for compost or digestate. Another reason for applying the same PAH limit values to all soil amendments is the principle of not allowing total PAH concentrations in soil to build up over time and keeping total concentrations below the limit values set in regulations to protect soil from pollution.

Hilber et al. 2019 [30] demonstrated that using low PAH limit values is prudent and reasonable. When biochars with higher contents of PAHs (up to 60 mg Σ16 EPA-PAH per kg biochar) were introduced in the rumen of a fistulated bovine, more than half of the PAHs from the biochar were released in the digestive system of the cow and may thus have impaired the biological system. Therefore, applying the precautionary principle and complying with existing regulations for other substrates and materials in agriculture and industry, the EBC limit values for PAHs were set for the various application classes on the following existing legal regulations and considerations:

In the EU fertilizer product regulation, a limit value of 6 mg $kg^{-1}$ DM wasset for the sum of 16 EPA-PAH [3,31]. Since 2021, this limit value applies to EBC-Agro. The list of 16 individual PAH compounds was compiled by the U.S. Environmental Protection Agency to allow monitoring and regulation of PAHs. These 16 compounds were selected from hundreds of PAHs [32] based on environmental relevance, toxicity, and ability to measure them.

The reason for using the 16 EPA-PAHs as reference and the selection of such low limit values is, as explained above, not based on biochar science or biochar-based risk assessments but is entirely based on limit values that were established for other soil-amendments like compost, digestate, plant substrates, and (contaminated) soil itself. In absence of investigations how PAHs in biochar may pose risks to the environment and health, it was easier and faster to use the lowest known limit values for any type of soil amendment and apply it for biochar, too. The alternative to this pragmatic decision would have been to wait until systematic research would eventually provide the evidence to set new limit values specifically for biochar to protect soils, plants, animals, workers, and consumers. As a result, the application of biochar would not have been authorized for many years to come. For this reason, the EBC applied and defended the low PAH limit values in its standards since 2012.

For animal feed, no EU or member state limit value for PAHs exist so far, and thus no PAH limit value for feed grade biochar neither. However, with the publication of Hilber et al. [30], we know that PAHs might get desorbed in cattle rumen and thus may harm animals that are regularly fed with biochar containing fodder. Moreover, the EBC should not allow that biochar with too high amounts of PAHs entered the soil via the animal feed pathway. As the current EU laws do not prohibit feeding an animal with substances that would not be permissible as a soil amendment, it is extremely important that biochar used as an animal feed additive is subjected to PAH quality control.

It is at least questionable, if selecting the 16 EPA-PAH compounds is the best choice for monitoring PAHs on biochar. Using a limit value for the simple sum of those 16 PAHs attributes equal importance to each of the individual substances in the interpretation of the analysis. Although all 16 PAHs are among EPA's priority environmental pollutants, this list can be divided into eight PAHs with insufficient or no evidence of carcinogenicity and eight carcinogenic PAHs[1]. The latter compounds 'should be given special attention [33] and, consequently, the EBC defines limit values for Σ8 EFSA PAHs as follows.

In 936 biochar analyses using the EBC-accredited methods, we found that the eight non-cancerogenic PAHs accounted for more than 80% of all analysed PAHs. Given the high number of analyses this can be considered a common distribution of PAHs adsorbed by biochar in common pyrolysis and gasification technologies [16]. The current Σ16 EPA-PAH limit values for biochar are thus based on the assumption that this is the general distribution of the individual PAH compounds. It is, however, technically possible to reduce the content of smaller (non-cancerogenic) PAHs in post-pyrolytic treatments whereas the more complex (cancerogenic) PAHs remain in the biochar because of the higher affinity of biochar for higher molecular weight-PAHs.

[1] *The eight cancerogenic compounds within 16 EPA PAH = 8 EFSA PAH* are Benzo[*a*]pyrene, Benzo[*a*]anthracene, Chrysene, Benzo[*b*]fluoranthene, Benzo[*k*]fluoranthene, Dibenzo[*a,h*]anthracene, Indeno[1,2,3-*cd*]pyrene, Benzo[*ghi*]perylene

Hence, the 6 mg Σ16 EPA PAHs $kg^{-1}$ of such a biochar could mainly consist of cancerogenic substances like Benzo[*a*]pyrene (BaP). Such high contents of cancerogenic substances would pose a considerable health risk when applied to feed and soil. To avoid such risks due to potential post-pyrolytic treatment of highly PAH-contaminated biochars, the EBC introduced in 2022 a new limit value for the eight cancerogenic compounds that are included in the 16 EPA PAHs (see footnote).

The EBC follows the European Food Safety Authority's (EFSA) suggestion to evaluate food safety by monitoring the total concentrations of these eight cancerogenic PAHs [34]. In the data set of the 936 EBC Σ16 EPA PAHs analyses, 99% of all analysed samples that complied with the EBC-Agro limit value of 6 mg Σ16 EPA PAHs $kg^{-1}$ contained less than 1 mg Σ8 EFSA PAHs $kg^{-1}$. As we do have assurance from the EBC-certification control that none of the 936 samples were subjected to post-pyrolysis treatment to reduce selected PAH-species, we can assume with sufficient confidence that the 936 sample represent the common distribution of PAHs adsorbed by biochar in common pyrolysis and gasification technologies. In the case of post-pyrolytic treatment or the use of novel pyrolysis technologies that reduce selectively the lighter (non-cancerogenic) PAHs, the new limit value of 1 mg Σ8 EFSA PAHs $kg^{-1}$ is safer than the (higher) Σ16 EPA PAHs limit values that could mask elevated amounts of cancerogenic PAHs.

For the above reasons, 1 mg Σ8 EFSA PAHs $kg^{-1}$ is defined as the only PAH threshold for EBC-Feed, EBC-Urban, and EBC-ConsumerMaterials. For the purpose of quality control and to provide Carbon Standards International with a solid data base for (i) the introduction of further EBC classes, (ii) possible upcoming legislative changes, as well as (iii) the expansion of EBC to further countries/regions, the Σ16 EPA-PAH must be declared to Carbon Standards International for all certification classes.

To maximize safety of EBC-FeedPlus, EBC-Agro, and EBC-AgroOrganic, the 1 mg Σ8 EFSA PAHs $kg^{-1}$ and the 6 mg Σ16 EPA PAHs $kg^{-1}$ provided by the EU fertilizer product regulation apply concurrently. For EBC-BasicMaterials a limit value of 4 mg Σ8 EFSA PAHs $kg^{-1}$ is defined. The EU-REACH regulation's list of eight carcinogenic PAHs has two substances that differ from the 8 EFSA and the 16 EPA compounds[2]. To comply with the EU-REACH regulations, the EBC includes these two additional PAHs into its analytical program and controls that neither benzo[*e*]pyrene nor benzo[*j*]fluoranthene is contained at higher concentrations than 1 mg $kg^{-1}$ for all application classes.

[2] The COMMISSION REGULATION (EU) No 1272/2013 referes to Benzo[*a*]pyrene, Benzo[*e*]pyrene, Benzo[*a*]anthracene, Chrysene, Benzo[*b*]fluoranthene, Benzo[*j*]fluoranthene, Benzo[*k*]fluoranthene and Dibenzo[*a,h*]anthracene as PAHs that are classified as carcinogens. Compared to 8 EFSA PAH, which are a subset of the 16 EPA PAH, Indeno[1,2,3-*cd*]pyrene and Benzo[*ghi*]perylene are missing in the EU-regulation. However, Benzo[*e*]pyrene and benzo[*j*]fluoranthene are not part of either the 8 EFSA PAHs or the 16 EPA PAHs. Therefore, benzo[*e*]pyrene and benzo[*j*]fluoranthene have not yet been quantified in routine analysis of biochar but are added to the EBC-analyes since 2022 to guaranty conformity with the EU-REACH regulation.

The **EBC-Urban** limit value for PAHs is defined by the eight carcinogenic PAHs which provides reliable safeguards for workers, citizens and soil. Because PAHs are ubiquitous in urban environments (e.g., from car exhaust, tyre abrasion, domestic heating, and atmospheric deposition), and because biochar applied to urban soil is a strong adsorber for PAHs, EBC-certified biochar will act in the urban environment as a net adsorber of those environmental toxins.

The limit values for **EBC-ConsumerMaterials** are stricter than the EU-REACH regulation for consumer products which bans all products containing more than 1 mg $kg^{-1}$ of one of the eight individual carcinogenic PAHs [1]. The EBC assumes it as consistent to use the same limit value of cancerogenic PAHs for soil, feed, food, water, ecosystem, and consumer product applications.

The limit value for Σ8 EFSA PAHs in **EBC-BasicMaterials** is 4 mg $kg^{-1}$ because the biochar particles are embedded and firmly bound into mineral or polymeric matrices (e.g., concrete, asphalt, plaster, composites) and direct contact with living organisms can be avoided. This limit is mainly based on what can be regarded as harmless to employees handling the raw materials with adequate safety measures (packaging, storage, and ventilation) and suitable personal protective equipment. Moreover, the EBC applies for BasicMaterials also and additionally the EU limit value for products where skin contact can be expected which is a maximum of 1 mg $kg^{-1}$ for each individual compound of the 8 EFSA PAH and for the additional EU-PAHs benzo[e]pyrene, and benzo[j]fluoranthene.

Thanks to the above outlined requirements, all EBC certified biochars are compliant with the EU-REACH commission regulation [1]. Still, the Σ16 EPA-PAH must be declared to CSI for all EBC certification classes.

It should be noted that due to the high adsorption capacity of biochar, most of the analytical methods used for example for soil analysis of PAHs are not suitable for biochar [19]. It is therefore strongly recommended to always use the service of EBC accredited laboratories to perform PAH analyses even outside of the context of EBC certification.
The very low PAH limit values only allow an analytical accuracy of 40% for the 6 mg Σ16 EPA PAHs $kg^{-1}$ limit value which implies an accuracy of ± 2.4 mg $kg^{-1}$ dm.

# 8. Pyrolysis

### 8.1 Biomass pyrolysis must be operated in an energy efficient manner.

Except for the preheating of the pyrolysis reactor, the use of fossil fuels for heating the pyrolysis reactor is prohibited. The use of waste heat from other industrial processes, such as bio-digesters or cement production or the use of solar thermal energy is permitted. If the pyrolysis reactor is electrically heated, the use of renewable energy sources or the use of surplus electricity is recommended.

### 8.2 The pyrolysis gases produced during pyrolysis must be recovered or burned. They are not allowed to escape into the atmosphere.

A significant portion of the global charcoal and biochar production is still made using obsolete technology [35] where most of the original feedstock carbon is released as toxic emissions to the atmosphere. Although the material quality of biochar produced in such kilns may meet EBC requirements, the environmental impact of such production techniques is highly negative.

However, if pyrolysis gases are trapped and are cleanly burned or used as bio-oil for the chemical industry, the environmental impact is neutral and even improved compared to biomass burning or natural decomposition. The EBC certificate guarantees that only climate positive biochar production technology is used and does not release unburned pyrolysis gases to the atmosphere.

### 8.3 Syngas combustion must comply with national emission limit values.

With emission limit values and regulations differing from one country to the next, any further definition of emission limit values for pyrolysis facilities would exceed the purpose and proportionality of these guidelines. Therefore, manufacturers must provide a guarantee that their facilities comply with national emission regulations. An annual, government accredited emission measurement of the production plant is recommended.

For certification of the C sink potential of biochar, the pyrolysis unit must have an EBC type certificate (see Guidelines for the certification of the C-sink potential) or at least three independent, accredited emission measurements including the methane or hydrocarbon content in the waste gas stream.

### 8.4 Biochar production must be energy and carbon efficient

Approximately 35 to 60 % of the energy contained in the biomass feedstock is eventually contained in the pyrolysis gas, which is usually burned in the pyrolysis unit. Part of the energy released during the combustion of these gases is often used to heat the biomass for pyrolysis. Excess heat must be used to at least 70%, e.g., for drying biomass, for district heating, for generating electricity or for similar sustainable purposes. For a transitional period of maximum 3 years after installation of the pyrolysis plant, an exemption for missing waste heat recovery can be applied for. In the meantime, a solution for efficient waste heat recovery must be developed.

Alternatively, the pyrolysis oil and/or gas can also be captured and used for energy storage, e.g., to deliver peak loads in district heating in winter by burning pyrolysis-oil that was collected during summer. The material use of the bio-oil and/or the upgrading of the pyrolysis gas into basic chemicals such as methanol are also conceivable options to reach eventually a carbon efficiency of at least 70%.

# 9. Work safety and health

9.1 Fire and dust protection regulations are to be complied with local and national regulations throughout the entire production, transportation, and user chain. An official operating permit or equivalent document must be presented.

9.2 All workers must be informed in writing about possible risks and dangers of and around the production facility and sign the document. This concerns, in particular, the self-ignitability of char dust, respiratory protection, contact with bio-oil and tars and possible gas leakage.

9.3 During transportation and bulk transfers, attention must be paid to the biochar being sufficiently moist to prevent dust generation or dust explosions (cf. chapter 7.7).

9.4 Workers must be equipped with suitable protective clothing and breathing masks where necessary.

# 10. Biochar for use as a feed additive - EBC-FeedPlus and EBC-Feed

Biochar is a traditional feed additive that was often used to treat digestive problems of livestock. Since 2010, biochar is increasingly also used as an additive to daily feed mixtures. The use of biochar (i.e., vegetal carbon) as a feed additive is authorized by the EU-Feed regulation L 159 / 25 Nr . 575 / 2011 [2]. The EU provides different and additional limits for the use of biochar as feed compared to its use as a soil additive (Directive 2002/32/EC of 7 May 2002 on undesirable substances in animal feed [2] and Regulation (EC) No 396/2005 on maximum residue levels of pesticides in or on food and feed of plant and animal origin [36]. Therefore, the certification of EBC-FeedPlus and EBC-Feed requires the analysis and control of additional parameters compared to those presented in chapter 7 and Annex 1 of the EBC Guidelines. Some analytical methods and calculations have to be adapted. **The permissible test methods as well as the analytical methods for the individual parameters are detailed in Annex 2.**

## 10.1 Approval as animal feed producer

Producers of EBC-Feed Plus and EBC-Feed certified biochars must mandatorily register as feed producers with the relevant authorities in accordance with applicable regional, national and/or EU regulations and submit proof of this to the EBC.

The aim of EBC-FeedPlus and EBC-Feed is to guaranty that the biochar quality is apt for animal feeding and that its production is sustainable. The equally important aspects of feed safety and hygiene during production, and especially storage and transport, can only be controlled by the EBC to a limited extent and thus not fully be guaranteed.

## 10.2 Biomass - only pure plant biomass feedstocks are permitted

When the original EBC-Feed Certificate was introduced, only untreated trunk wood was approved as the source material for feed grade biochar production. In the meantime, however, a sufficient number of scientific studies have been published [37], which show that biochar produced from other plant biomass had just as positive an effect on feed efficiency and animal health as wood based biochar. For this reason, all pure plant biomasses are approved since 2020 for the production of EBC-FeedPlus and EBC-Feed biochar according to the EBC feedstock list. Mineral additives are not permitted. Feedstocks with chemical additives, contaminations, or the risk of contaminations due to non-controllable source are excluded for the production of EBC-FeedPlus and EBC-Feed (e.g., chemically treated wood, paper sludge, green waste from municipal collection, etc.).

### 10.3 Separation of impurities

A significant risk to feed safety comes from possible impurities that can contaminate the biochar via the feedstock, the production process, or during storage. These are mainly pieces of metal, plastic, glass, and stones. Thus, rigorous control of the feedstock is necessary before it enters the pyrolysis process. To prevent metal and other impurities originating from the pyrolysis plant, it is necessary to regularly check the plant (check that no screws are missing, parts are broken or that abrasion occurs, etc.). To exclude the possibility of impurities entering the feed biochar after production, the biochar must be packaged and stored tightly sealed.

It is recommended to pass both the biomass before entering the pyrolysis unit and the biochar between discharge and packing through a magnetic metal separator. Also, stones and glass fragments pose a risk of injury to the animals if swallowed, mainly because of possible sharp edges and corners, and may also be present, for example, in source materials such as forest wood chips or crop residues otherwise commonly assumed to be clean. To at least eliminate this risk, in addition to using a stone separator, grinding the biochar to < 3 mm is recommended; silicate (glass) and stone per se are not toxic or harmful.

Feed manufacturers must be able to guarantee that marketed feed products are free of impurities following government requirements. According to Regulation (EC) 183/2005, a feed producer is responsible for feed safety. The EBC control processes (technical pre-audit, annual EBC inspection, visual inspection of random samples, laboratory analysis of a representative sample from each batch, reserve samples, documentation) provide assistance in this regard, but cannot replace the manufacturer's guarantee. In the event of complaints from users or other complaints and disputes, certification as an EBC-FeedPlus and EBC-Feed offer only limited security. To meet the responsibility for feed safety, EU Regulation 183/2005 strongly recommends that feed producers implement a Hazard Analysis and Critical Control Point (HACCP) system ("Feed business operators [..] shall put in place, implement, and maintain, a permanent written procedure or procedures based on the HACCP principles"). We therefore recommend additional external quality assurance by a certification body specialized in feed, such as GMP+ (https://www.gmpplus.org) or pastus+ (https://amainfo.at/en/teilnehmer/futtermittel/pastus-zertifizierung/richtlinie-informationen). Their certification process includes HACCP.

### 10.4 Pyrolysis temperature (HTT > 500 °C) and intensity (H/Corg < 0.4)

Although contaminated feedstock is not allowed within EBC-FeedPlus and EBC-Feed, trace contaminations, e.g., with pharmaceuticals or mycotoxins, can never be excluded completely. To assure the complete degradation of these organic micropollutants the pyrolysis temperature has to reach at least 500 °C for at least 10 min [38]. As these pyrolysis conditions are difficult to monitor

and control, the $H/C_{org}$ ratio is used as a proxy. The $H/C_{org}$ ratio indicates the degree of aromatization of biochar carbon and thus the intensity of pyrolysis. If a biochars presenting an $H/C_{org}$ ratio below 0.4, it is safe to assume that it was produced at temperatures above 500°C for more than 10 minutes and is safe for animal consumption. The $H/C_{org}$ ratio must not exceed 0.4 for EBC-FeedPlus and EBC-Feed. For EBC-Feed, biochars with H/Corg < 0.7 are still allowed during a transition period until Dec. 31, 2023 (latest possible end of a batch).

### 10.5 Heavy metals

According to feed regulations, the content of heavy metals including arsenic, lead, cadmium and mercury must be stated. The use of biochar as feed is based on the following limit values to be calculated on 88% of the dry matter content: arsenic: 2 mg $kg^{-1}$; lead: 10 mg $kg^{-1}$; cadmium 0.8 mg $kg^{-1}$ and mercury: 0.1 mg $kg^{-1}$.

### 10.6 PAHs

The limit value for the Σ8 EFSA PAHs is set to 1 mg $kg^{-1}$ (see chapter 7.12) for EBC-FeedPlus and EBC-Feed. To comply with the EU-REACH regulations, benzo[e]pyrene and benzo[j]fluoranthene must not be contained at higher concentrations than 1 mg $kg^{-1}$. For EBC-FeedPlus, the Σ16 EPA PAHs must not exceed 6 mg $kg^{-1}$.

Due to the missing threshold value for Σ16 EPA PAHs, EBC-Feed does not comply with EBC-AgroOrganic and EBC-Agro requirements. From the animal perspective, it should be highlighted that naphthalene is the most abundant PAH congener in biochar, which is included in 16 EPA PAHs but not in Σ8 EFSA PAHs. According to a summary of the Environmental Protection Agency of the United States, the NOAEL (No Observed Adverse Effect Level) for chronic oral exposure of naphthalene is in the range of 50-100 mg per kilogram live weight of the animal [39]. It is practically impossible to achieve this level by feeding biochar.

EBC-FeedPlus biochar can be used as a soil amendment and for any other agronomic purposes such as composting, anaerobic digestion, manure treatment, and fertilizer production. EBC-Feed may only be used as animal feed additive.

### 10.7 Dioxine, furane, dioxin-like PCB (WHO-PCB) und non-dioxin-like PCB (DIN-PCB).

The EU feed regulations prescribe strict limits for polychlorinated dioxins, furans and PCBs, which are well below the limits of the soil protection ordinance. Therefore, (1) each batch of feed biochars must be analyzed for these substances, and (2) the accredited test method must have a lower detection limit. Consequently, special test methods and limit values for feed grade biochar apply here.

For PCDD / PCDF, a trigger value of 0.5 ng TE $kg^{-1}$ at 88% DM and a limit of 0.75 ng TE $kg^{-1}$ at 88% DM apply. For dl-PCB, a trigger value of 0.35 ng TE $kg^{-1}$ at 88% DM applies. For PCDD / PCDF + dl-PCB the limit value is 1.25 ng TE $kg^{-1}$ at 88% TS. For the sum 6 of DIN PCB, a limit value of 10 µg TE $kg^{-1}$ at 88% DM applies.

### 10.8 Fluor < 150 mg $kg^{-1}$ (88% TS)

The fluor content must be lower than <150 mg kg-1 (88% TS). However, fluorine salts are usually volatile in pyrolysis conditions and will rarely occur in biochars in significant concentrations.

### 10.9 Dry matter, crude ash, ash insoluble in hydrochloric acid

The specification of dry matter, crude ash content and HCl-insoluble ash are prescribed standard values of the EU feed regulations and must be stated on the product label. The content of the ashes must be determined by combustion at 550 ° C and given on an 88% dry matter basis.

### 10.10 Crude protein, crude fibre, crude fat

The indication of crude protein, crude fiber and crude fat contents are prescribed standard values of the EU feed regulations. Crude protein, crude fiber and crude fat are completely decomposed in the course of complete pyrolysis and are therefore no longer present in biochar. A biochar is considered to be completely pyrolyzed if the $H/C_{org}$ ratio is <0.4, which is the prerequisite for EBC-Feed and EBC-FeedPlus certification. Thus, the analysis of crude protein, crude fiber and crude fat is not required and set by definition as 0 g $kg^{-1}$. The information is mandatory and must be stated on the product label.

# 11. Certification of companies that process biochar and manufacture biochar-based products

In agriculture and animal husbandry, biochar is rarely used in its pure form. More often it is part of a processed product such as a soil-amendments, potting soil, compost, fertilizer, bedding material, feed, or as an additive to anaerobic digestion or silage. In addition to the producers specialized in biochar manufacturing, a growing industry has developed, acquiring and processing biochar as a raw material for biochar-based products.

To guarantee and properly label products made with EBC certified biochar, the entire supply chain including production, processing, packaging, and labeling of the products needs to be inspected and certified.

Products containing biochar are only allowed to use the EBC logo and the inscription "Manufactured with EBC certified biochar" if the biochar processing company and their biochar-based products have also been certified according to the following guidelines.

## 11.1 Exclusive use of EBC certified biochar

The risks associated with the use of non-certified biochar in agriculture, livestock farming and in products ultimately destined for agricultural use, such as compost or biogas slurry, are very high, since in this case pollutants such as PAHs, dioxins and heavy metals may enter the human food chain and accumulate permanently in soils and the environment.

Therefore, products made with biochar can only become EBC certified if the processing company uses exclusively EBC certified biochar for their biochar-based products. The certified company may not use, store, or trade any biochar for agronomic purposes that is not EBC certified.

Without EBC exemption, no non-EBC certified biochar may be used, stored and traded by the certified company.

## 11.2. Incoming goods inspection

All incoming biochar or biochar-based products must have the corresponding EBC certificate (EBC-FeedPlus, EBC-Feed, EBC-AgroOrganic, EBC-Agro, EBC-Urban, EBC-ConsumerMaterials, EBC-BasicMaterials) marked on the delivery documentation and labels. The incoming goods inspection must be documented. Unlabeled biochar and biochar-based products without an EBC exemption permit must not be processed.

### 11.3 Storage

Biochar and biochar-based products must be stored in such a way that no contamination can occur. Particular attention should be paid to gaseous pollutants (for example engine exhaust gases) as these can be absorbed by the biochar. Biochar processors must ensure that neither different EBC certification classes nor different batches from different or the same manufacturers are mixed without documentation. The quality and origin of stored biochar as well as a traceable identification number and product name must be marked clearly visible on the storage or packaging material.

### 11.4 Processing journal

Each processing step of biochar and biochar-based products must be documented in a processing journal. The quantity and quality of all processed biochar and the amount of biochar contained in the final products must be documented.

If the biochar or biochar-based products are merely repackaged or relabeled, the quantity and quality of the original and final products must still be listed in the processing journal.

The control of the flow of goods (balance between incoming biochar and biochar products, specific processing, and the outgoing biochar and biochar products) must be tracked and always documented.

# 12. Labeling and Advertising with EBC Certification

## 12.1 Trademark protection and compulsory information

### 12.1.1 Registered trademarks

Carbon Standards International owns the following EU trademarks:

(1) EU guarantee mark No 018071838 'EBC' (word mark) and

(2 ) EU guarantee mark No 018071835 'Certified Biochar EBC European Biochar Certificate (EBC)' (figurative mark), reproduction:


(hereinafter referred to as 'EU trademarks').
Each of the EU trademarks are registered in respect to the following list:

Class 01: Chemical substances, chemical materials and chemical preparations and natural elements, in particular biochar, activated carbon activated adsorbents, activated carbon filters for the purification of gases, and activated carbon filters for the purification of liquids; Growth and fertilizers and chemicals used in agriculture, forestry and horticulture, in particular fertilizers (in part) consisting of biochar (biochar); Putties, fillers and glues for industrial purposes, in particular coal for filters for removing organic contaminants from water; Filter materials [chemical, mineral, vegetable and other raw materials], in particular activated carbon.
Class 04: Fuels, in particular of biochar (charcoal, charcoal).
Class 05: Biochemical feed additives made from biochar.
Class 19: Building materials and components, not of metal, (partially) consisting of biochar.
Class 31: Foodstuffs and animal feed (in part) consisting of biochar (biochar); Litter and bedding materials for animals (partially) consisting of biochar (biochar).
Class 40: Production of coal by biomass pyrolysis; Processing of biochar (biochar) as a raw material for the production of various products.

(hereinafter referred to as 'the goods and services claimed')

### 12.1.2 Right to use the EU trademark

Carbon Standard International grants:

(1) Manufacturers of EBC certified biochar, as well as of products containing EBC certified biochar,

(2) Processors and traders of EBC certified biochar and products containing EBC certified biochar and

(3) Users of EBC certified biochar (e.g., farmers, operators of composting plants, operators of biogas plants) as well as of products containing EBC certified biochar (e.g., farmers, gardeners, animal keepers).

the right to use these EU trademarks for the aforementioned goods and services under the following conditions:

The EU guarantee trademark No 018071838 "EBC" (word mark) may only be used alone or with the following additions

(1) "Zertifikat" / "Certificate", oder "Zertifizierung" / "Certification" oder "zertifiziert" / "certified"

(2) "Agro", "AgroOrganic", "FeedPlus", "Feed", "Urban", "ConsumerMaterials", "BasicMaterials"

The EU guarantee trademark No 018071835 "Certified Biochar EBC European Biochar Certificate (EBC)" (figurative mark) may only be used as registered. Additions or modifications are not permitted.

### 12.1.3 Advertising with laboratory analysis according to EBC standard

If an analysis of the biochar has been carried out by an accredited laboratory (see list at www.european-biochar.org/en/ct/10) in accordance with the EBC standard, but no EBC certification was obtained, the lack of certification must be pointed out in a suitable form when advertising the analysis result. Misleading statements in this regard should be avoided in any case. Permissible are for example formulations like "laboratory analysis after EBC standard*", footnote: "not certified".

### 12.1.4 Contractual penalty

If the user of the warranty marks culpably violates the statutes of these trademarks, he is liable to pay a fine of 500, - EUR to 10,000, - EUR to the Foundation Ithaka Institute. The amount of the fine to be paid shall be determined by Carbon Standard International at its reasonable discretion and, in the event of dispute, reviewed by a court of law as to its appropriateness. Accordingly, Carbon Standard International deprives the user of the right to use the warranty marks.

### 12.2 Mandatory information on biochar

The label or delivery note for unprocessed EBC biochar must indicate at least the following information about the biochar:

- The application class of the biochar (EBC-FeedPlus, EBC-Feed, EBC-AgroOrganic, EBC-Agro, EBC-Urban, EBC-ConsumerMaterials, EBC-BasicMaterials)

- Organic carbon content ($C_{org}$)

- H / $C_{org}$ – ratio

- pH

- Dry weight

- Volume

All other relevant analytical information such as feedstock, pyrolysis temperature, elemental analysis, nutrient content, heavy metals, WHC, electric conductivity of the solid biochar, and ∑8 EFSA PAHs can be found via the QR-code of the certified batch. **The QR-code of the EBC-certified batch must be printed on the packaging and the delivery note.** The analytical parameters of the biochar uploaded by the accredited laboratory can thus be accessed via this QR code.

If the packaging units are produced before the QR code is created - such as packaging for the end consumer - a company's own QR code on the packaging unit can link the product to the company's website, from where a permanent redirection to the EBC website of the certified batch must be set up before the packaging units are sold.

### 12.3 Production date and QR code

In addition to the QR code of the biochar batch, the production date must be noted on each packaging unit. For large packaging or storing units whose contents are produced over several days, the production period must be marked.

### 12.4 Mandatory information about biochar containing products

The shipping label and the biochar product packaging label shall include the following information:

- The application class of the biochar (EBC-FeedPlus, EBC-Feed, EBC-AgroOrganic, EBC-Agro, EBC-Urban, EBC-ConsumerMaterials, EBC-BasicMaterials)

- Organic carbon content of the biochar used in the product

- Biochar content in dry matter contained in the packaging unit

If biochars of different EBC application classes are used in one product, the end product may only bear the EBC application class(es) whose requirements have been met by each individual biochar.

If several EBC certified biochars are mixed in the product, a corresponding averaged values for the organic carbon and nutrient content based on the mass (dm) of the blended biochar portions must be reported. H / $C_{org}$ – ratio, the highest temperature reached in the pyrolysis process, electric conductivity, WHC, and pH must be provided as the range of the lowest and highest value of the individual biochars used.

Certified resellers of biochar or biochar products do not need to name and identify the original company or production site of the biochar.

# 13. Control, quality management and certification

## 13.1 Principles of certification

The inspection of the European biochar certificate is coordinated worldwide by the independent, state-accredited inspection body bio.inspecta AG / q.inspecta GmbH. The inspection is carried out on site at each production facility. It takes place once a year. Producers are obliged to keep their production records up to date in accordance with their respective EBC instruction manual (see 12.5).

If a biochar producer desires to become EBC certified, their entire biochar production site must be inspected and certified, regardless of whether only one batch, several or all batches qualify for one of the EBC certificates.

Should an EBC certified producer produce a batch that cannot be certified to EBC BasicMaterials due to non-compliance with limit values, the producer must prove proper disposal of this waste according to local or national regulations. Otherwise, the certification of the plant may be permanently withdrawn.

Biochar processing companies may be exempted from the annual inspection visit to the production site if they can prove that they process less than 10 t of biochar per year. In such cases, compliance with the production and quality guidelines is evaluated by the government accredited inspection body by means of self-declaration and production protocols.

## 13.2 EBC-certified companies

For production, processing and trade of EBC biochar, a distinction is made between four company types:

### a) Biochar producer (on-site inspection)

Biochar producers operate pyrolysis plants and manufacture EBC-certified biochar from biomass. Additionally, they may grind, screen, and/or package biochar. Only biochar produced by the company itself may be stored on the premises, otherwise additional certification as a processing company and trader is required.

If the biochar is further processed by other, non-pyrolytic process steps (e.g., by charging it with nutrients, mixing it into compost, fermentation, activation or blending with other products), an additional EBC certification as a processing company and trader is required.

A technical pre-audit by Carbon Standard International and an annual inspection visit by the accredited inspection body are mandatory. The representative sampling must be carried out by an accredited sampler.

### (b) Processing companies and traders (on-site inspection if > 10 t p.a.)

Processing companies that purchase EBC-certified biochar and use it to manufacture new, biochar-based products, must be EBC certified. Common processes are the blending of biochar with additives, activation by thermal processes (production of activated carbon), enhancement by biological and/or chemical treatment or mechanical processing. Furthermore, the mixing of different EBC-certified production batches, which may also be purchased from different EBC-certified manufacturers, also falls under the category of processing (cf. chapter 11).

The trade of unpackaged, loose goods (e.g., containers) or repackaging of purchased biochar is also subject to the inspection and certification obligation for biochar processing plants.

The initial audit is carried out by the accredited inspection body, which also determines the processing protocols and the protocols for documenting the flow of goods with the processing companies.

### (c) Trader of packaged goods – no certification needed.

The mere trade by third parties of pre-packaged biochar and biochar-based products labelled by the certified manufacturer according to EBC regulations is not subject to any further inspection and certification obligation.

Therefore, if a non-certified company or person sells EBC-certified biochar or biochar-based products, both the certified manufacturer and the unique ID number and QR code of the biochar batch must be clearly traceable. The certified manufacturer must therefore be named on the label and delivery note. Consequently, the label affixed by an EBC certified company must not be altered, pasted over or removed. If the original label is removed or covered over, the goods are no longer considered EBC certified. Additional labels, however, may be applied alongside the original labels.

If the original manufacturer is not named on the packaging or the delivery note and the goods are thus relabelled, the company placing the goods on the market must then be EBC certified, otherwise it may not label the goods as EBC certified.

The relabelling of closed packaging of certified biochar and biochar-based products or the sale under own trade name without mentioning the actual manufacturer is subject to the certification obligation as a private label trader.

### (d) Private Label Traders (remote inspection)

If the biochar and biochar-based products are manufactured, packaged, and labelled by the manufacturer for another company, and the name and contact information of the manufacturing company do not appear on the packaging, the retailer marketing the goods under its brand name must be EBC certified as private label trader. Otherwise, the own brand retailer may not label the goods as EBC certified.

This also applies if closed packaged biochar goods are purchased from other manufacturers or distributors and then relabelled in such a way that the manufacturing company and its contact

data are no longer recognizable as such. The company placing the goods under its own brand must necessarily be EBC certified. Otherwise, he may not label the goods as EBC-certified.

Provided there is no repackaging of the goods, EBC certification of private label traders does not require on-site inspection; it can be done via online declaration and remote assessment.

### 13.3 Registration for certification

To register for certification, please register your company on the EBC website (www.european-biochar.org) and provide all necessary information about your company and production. You will then be contacted by the team of Carbon Standards International (www.carbon-standards.com) who will assist you throughout the entire certification process.

It is highly recommended that new biochar producers contact Carbon Standards International before commencing operations to ensure all required recording procedures are initiated and incorporated into the production processes.

**Carbon Standards International AG**
Ackerstrasse 117
5070 Frick
Switzerland
Tel. +41 (0) 62 552 10 90
info@carbon-standards.com

### 13.4 Technical pre-audit of biochar producers

The technical pre-audit of biochar producers is carried out by Carbon Standard International. The aim of the initial audit is to understand the technical production process to identify potential problems for the certification and quality management. During the technical pre-audit, the standard method and frequency of accredited sampling, the type of retained samples, the determination of dry weights, and the plant's own quality control program may be adapted, if necessary. All adaptations and precessions of the usual certification and quality management procedures, are documented in a specific online instruction manual prepared by Carbon Standard International.

The initial technical audit of biochar producers includes the following steps:

1) The company uploads the detailed technical description and flow charts of the production process to the EBC website.
2) In a video conference between the company to be certified and the Ithaka Institute, open questions are addressed, the technical production details are discussed, and the scope of the on-site visit clarified.

All detailed technical information shared between the production company, the Ithaka Institute, Carbon Standards International, and q.Inspecta are subject to strict confidentiality and are protected by data protection law. If desired, a non-disclosure agreement (NDA) can be signed between Carbon Standards International and the company to be certified.

Fundamental changes in operational procedures must be reported to Carbon Standards International and may lead to a repetition of the technical audit and an adaptation of the EBC online instruction manual. The accredited inspection body may also order a new technical audit due to operational changes that prevent the inspection visit from being carried out in a meaningful way.

Processors and traders of biochar are subject to an initial audit by the inspection body bio.inspecta AG, but do not need a separate technical audit by the Ithaka Institute.

### 13.5 EBC instruction manual

The present EBC guidelines describe the basic requirements for EBC certification. For biochar producers, an EBC instruction manual based on these guidelines may describe the exact implementation of these rules where necessary. This includes:

- Organization of the operating documentation,
- Procedure for the annual inspection visits
- Responsibilities of the EBC quality manager
- Requirements for occupational health and safety
- Flow charts for representative sampling
- Flow chart and documentation for taking and storing the retention samples
- Additional analyses of critical or strongly varying parameters (e.g., PAH, heavy metals, contamination or impurities of biomasses, etc.).
- Determination of the dry matter content for each individual packaging unit, if the C-sink potential is to be determined for the individual batches

The EBC instruction manual is a contract between the EBC-certified company and Carbon Standards International. The instruction manual is treated confidentially by the inspection body and Carbon Standard International.

Processing companies and biochar traders do not receive a separate instruction manual.

### 13.6 EBC quality manager

The management of the certified company must appoint a quality manager who is familiar with the effects of the various production processes on the quality of the biochar. The quality manager must be authorised within the company to implement measures to ensure and control the quality of the biochar and to document them.

The quality manager is the contact person for the accredited inspection body (bio.inspecta) and Carbon Standards International as EBC label holder. If there is a change of personnel in the position of quality manager, the inspection body and Carbon Standards International must be informed immediately.

In the first year and later at least once per certification period, the quality manager is obliged to participate in external trainings of the EBC on the production, quality assurance and application of biochar. The training must be approved by the responsible management.

The quality manager must ensure the proper documentation and evaluation of the operational processes that influence the quality of the biochar. The documentation must be continuously updated and should be regularly submitted to the management of the company. Information about detected defects must be immediately forwarded to the responsible employees and the defects must be corrected.

The quality manager is the contact person for his colleagues in case of disturbances in the production process. He may delegate individual control and documentation tasks to other employees. In this case, he must instruct the responsible employees and monitor the proper execution of the assigned tasks.

# 14. References


Deutsche Bundes-Bodenschutz- und Altlastenverordnung (BBodSchV), 1999, latest amendment 31.7.2009

1. REACH COMMISSION REGULATION (EU) No 1272/2013 of 6 December 2013 amending Annex XVII to Regulation (EC) No 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) as regards pol. *EU-Regulation* 2013, *1272/2013*.
2. EU-Parliament *Commission regulation (EU) No 575/2011 of 16 June 2011*; Brussels, 2011;
3. EU-Comission *Regulation (EU) 2019/1009 - EU fertilising products and amending regulations*; Brussels, 2019; p. 2019/1009;
4. EU-Comission *Commission implementing regulation (EU) 2019/2164 on organic production and labelling of organic products*; Brussels, 2019;
5. Gy, P. Sampling of discrete materials—a new introduction to the theory of sampling. *Chemom. Intell. Lab. Syst.* 2004, *74*, 7–24, doi:10.1016/j.chemolab.2004.05.012.
6. Schimmelpfennig, S.; Glaser, B. One Step Forward toward Characterization: Some Important Material Properties to Distinguish Biochars. *J. Environ. Qual.* 2012, *41*, 1001, doi:10.2134/jeq2011.0146.
7. Yang, H.; Kudo, S.; Hazeyama, S.; Norinaga, K.; Mašek, O.; Hayashi, J. Detailed Analysis of Residual Volatiles in Chars from the Pyrolysis of Biomass and Lignite. *Energy & Fuels* 2013, 130531120623003, doi:10.1021/ef4001192.
8. Spokas, K.A.; Novak, J.M.; Stewart, C.E.; Cantrell, K.B.; Uchimiya, M.; DuSaire, M.G.; Ro, K.S. Qualitative analysis of volatile organic compounds on biochar. *Chemosphere* 2011, *85*, 869–882.
9. Camps-Arbestain, M.; Amonette, J.E.; Singh, B.; Wang, T.; Schmidt, H.-P. A biochar classification system and associated test methods. In *Biochar for environmental management*; Lehmann, J., Joseph, S., Eds.; Routledge: London, 2015; pp. 165–194.
10. EU-Parliament *EU fertilizer regulation 2019/1009*; Brussels, 2019;
11. BBodSchV *Bundes-Bodenschutz- und Altlastenverordnung*; Deutsches Bundesamt für Umwelt: Berlin, 1999;
12. Bucheli, T.D.; Hilber, I.; Schmidt, H.-P. Polycyclic aromatic hydrocarbons and polychlorinated aromatic compounds in biochar. In *Biochar for Environmental Management*; Lehmann, J., Joseph, S., Eds.; Routledge: London, 2015; pp. 595–624.
13. ChemRRV *Verordnung zur Reduktion von Risiken beim Umgang mit bestimmten besonders gefährlichen Stoffen, Zubereitungen und Gegenständen*; Bern, 2020;
14. Fagernäs, L.; Kuoppala, E.; Tiilikkala, K.; Oasmaa, A. Chemical Composition of Birch Wood Slow Pyrolysis Products. *Energy & Fuels* 2012, *26*, 1275–1283, doi:10.1021/ef2018836.
15. Buss, W.; Graham, M.C.; MacKinnon, G.; Mašek, O. Strategies for producing biochars with minimum PAH contamination. *J. Anal. Appl. Pyrolysis* 2016, *119*, 24–30, doi:10.1016/j.jaap.2016.04.001.

16. Bucheli, T.D.; Hilber, I.; Schmidt, H. Polycyclic aromatic hydrocarbons and polychlorinated aromatic compounds in biochar. **2014**, 593–622.

17. Bucheli, T.D.; Hilber, I.; Schmidt, H.P. Polycyclic aromatic hydrocarbons and polychlorinated aromatic compounds in biochar. In *Biochar for environmental management: Science and technology.*; earthscan, London, U., Ed.; 2015.

18. Cornelissen, G.; Pandit, N.R.; Taylor, P.; Pandit, B.H.; Sparrevik, M.; Schmidt, H.P. Emissions and char quality of flame-curtain "Kon Tiki" kilns for farmer-scale charcoal/biochar production. *PLoS One* **2016**, *11*, doi:10.1371/journal.pone.0154617.

19. Hilber, I.; Blum, F.; Leifeld, J.; Schmidt, H.-P.; Bucheli, T.D. Quantitative Determination of PAHs in Biochar: A Prerequisite To Ensure Its Quality and Safe Application. *J. Agric. Food Chem.* **2012**, *60*, 3042–50, doi:10.1021/jf205278v.

20. WHO Evaluation of certain food additives and contaminants: eightieth report of the Joint FAO/WHO Expert Committee on Food Additives Available online: https://apps.who.int/iris/handle/10665/204410 (accessed on Nov 27, 2021).

21. Hilber, I.; Mayer, P.; Gouliarmou, V.; Hale, S.E.; Cornelissen, G.; Schmidt, H.-P.; Bucheli, T.D. Bioavailability and bioaccessibility of polycyclic aromatic hydrocarbons from (post-pyrolytically treated) biochars. *Chemosphere* **2017**, *174*, doi:10.1016/j.chemosphere.2017.02.014.

22. Hilber, I.; Bastos, A.C.; Loureiro, S.; Soja, G.; Marz, A.; Cornelissen, G.; Bucheli, T.D. The different faces of biochar: Contamination risk versus remediation tool. *J. Environ. Eng. Landsc. Manag.* **2017**, *25*, 86–104, doi:10.3846/16486897.2016.1254089.

23. Li, H.; Qu, R.; Li, C.; Guo, W.; Han, X.; He, F.; Ma, Y.; Xing, B. Bioresource Technology Selective removal of polycyclic aromatic hydrocarbons ( PAHs ) from soil washing effluents using biochars produced at different pyrolytic temperatures. *Bioresour. Technol.* **2014**, *163*, 193–198, doi:10.1016/j.biortech.2014.04.042.

24. Costera, A.; Feidt, C.; Dziurla, M.A.; Monteau, F.; Le Bizec, B.; Rychen, G. Bioavailability of Polycyclic Aromatic Hydrocarbons (PAHs) from Soil and Hay Matrices in Lactating Goats. *J. Agric. Food Chem.* **2009**, *57*, 5352–5357, doi:10.1021/JF9003797.

25. Berset, J.D.; Holzer, R. Organic Micropollutants in Swiss Agriculture: Distribution of Polynuclear Aromatic Hydrocarbons (PAH) and Polychlorinated Biphenyls (PCB) in Soil, Liquid Manure, Sewage Sludge and Compost Samples; a Comparative Study. *http://dx.doi.org/10.1080/03067319508041324* **2006**, *59*, 145–165, doi:10.1080/03067319508041324.

26. Honda, M.; Suzuki, N. Toxicities of Polycyclic Aromatic Hydrocarbons for Aquatic Animals. *Int. J. Environ. Res. Public Health* **2020**, *17*, doi:10.3390/IJERPH17041363.

27. Patel, A.B.; Shaikh, S.; Jain, K.R.; Desai, C.; Madamwar, D. Polycyclic Aromatic Hydrocarbons: Sources, Toxicity, and Remediation Approaches. *Front. Microbiol.* **2020**, *11*, 2675, doi:10.3389/FMICB.2020.562813/BIBTEX.

28. Wu, H.; Sun, B.; Li, J. Polycyclic Aromatic Hydrocarbons in Sediments/Soils of the Rapidly Urbanized Lower Reaches of the River Chaohu, China. *Int. J. Environ. Res. Public Health* **2019**, *16*, doi:10.3390/IJERPH16132302.

29. Sigmund, G.; Huber, D.; Bucheli, T.D.; Baumann, M.; Borth, N.; Guebitz, G.M.; Hofmann, T. Cytotoxicity of Biochar: A Workplace Safety Concern? *Environ. Sci. Technol. Lett.* **2017**, *4*, 362–366, doi:10.1021/ACS.ESTLETT.7B00267.

30. Hilber, I.; Arrigo, Y.; Zuber, M.; Bucheli, T.D. Desorption Resistance of Polycyclic Aromatic Hydrocarbons in Biochars Incubated in Cow Ruminal Liquid in Vitro and in Vivo. *Environ. Sci. Technol.* **2019**, *53*, 13695–13703, doi:10.1021/acs.est.9b04340.

31. EU-Comission EXPLANATORY MEMORANDUM Available online: https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=PI_COM:Ares(2021)44211&from=EN.

32. Achten, C.; Andersson, J.T. Overview of Polycyclic Aromatic Compounds (PAC). *Polycycl. Aromat. Compd.* **2015**, *35*, 177–186, doi:10.1080/10406638.2014.994071.

33. Andersson, J.T.; Achten, C. Time to Say Goodbye to the 16 EPA PAHs? Toward an Up-to-Date Use of PACs for Environmental Purposes. *Polycycl. Aromat. Compd.* **2015**, *35*, 330–354, doi:10.1080/10406638.2014.991042.

34. EFSA Polycyclic Aromatic Hydrocarbons in Food - Scientific Opinion of the Panel on Contaminants in the Food Chain. *EFSA J.* **2008**, *6*, doi:10.2903/J.EFSA.2008.724.

35. Brown, R.; Campo, B. del; Boateng, A.A.; Garcia-Perez, M.; Masek, O. Fundamentals of biochar production. In *Biochar for environmental management*; Lehmann, J., Joseph, S., Eds.; Routledge: London, 2015; pp. 39–62.

36. EU-Parliament *Directive 2002/32/EC of the European Parliament and of the Council of 7 May 2002 on undesirable substances in animal feed - Council statement*; 2002; p. Official Journal L 140, 30/05/2002 P. 0010-0022;

37. Schmidt, H.-P.; Hagemann, N.; Draper, K.; Kammann, C. The use of biochar in animal feeding. *PeerJ* **2019**, *7*, e7373, doi:10.7717/peerj.7373.

38. Ross, J.J.; Zitomer, D.H.; Miller, T.R.; Weirich, C.A.; McNamara, P.J. Emerging investigators series: Pyrolysis removes common microconstituents triclocarban, triclosan, and nonylphenol from biosolids. *Environ. Sci. Water Res. Technol.* **2016**, *2*, 282–289, doi:10.1039/c5ew00229j.

39. USD *Toxicological profile for naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene*; 2005;

40. Bucheli, T.D.; Bachmann, H.J.; Blum, F.; Bürge, D.; Giger, R.; Hilber, I.; Keita, J.; Leifeld, J.; Schmidt, H.-P. On the heterogeneity of biochar and consequences for its representative sampling. *J. Anal. Appl. Pyrolysis* **2014**, 1–6, doi:10.1016/j.jaap.2014.01.020.

# Annex 1
# Analytical Methods for EBC-biochar
# Basic Package

The current issue date of the respective standard applies in each case. Further descriptions in this annex may contain deviations and/or concretizations with regard to the mentioned standard. The explanations in italics are only intended to provide the reader with basic information; the implementation is based exclusively and precisely on the standard referred to.

**Sample preparation (DIN 51701-3):**
After homogenization, the sample is divided representatively into portions. This subsampling is done by quartering (quarter method) of the homogenized sample. Approximately 100 g of the original sample are used for the determination of the conductivity, salt content, and pH.
A portion of the sample is dried at 40 ° C and is divided into some subsamples after drying and homogenization. Approximately 250 g of the 40 ° C dried and uncrushed sample is used to determine the true density and the BET surface of the material. Approximately 50 g of the 40 ° C dried sample is finely ground in a vibratory mill. After homogenization, the fine material is subsampled for further analysis (i.e., PAH, TGA, ash, CHN, S, trace, and major elements). Unless otherwise specified, the particle size of the analytical samples is specified by the respective methods and standards.

**Bulk density for ground particle sizes < 3 mm (analog VDLUFA-Method A 13.2.1):**
To calculate bulk density, a dried, water-free sample of at least 300 ml is poured into a graduated cylinder, and the mass is determined by weighting. The volume of the sample is read after 10 times compression by means of falling. The bulk density (on dry matter base) in kg / m³ is calculated from the mass and the volume of the sample.

**Bulk density of the unground sample as delivered (DIN EN ISO 17828):**
Only for particle sizes between 0.3 mm and 30 mm. The sample is analyzed as delivered, not dried, not milled.
NOTE: The bulk density of freshly produced biochar is subject to fluctuations due to several factors, such as vibrations, shocks, pressure, drying, and humidification. The measured bulk density may, therefore, have been altered by transport, storage, or handling.

**Electrical conductivity (salt content) - Method of the BGK (Federal Quality Association Compost), volume 1, method III. C2 – in analogy to DIN ISO 11265:**
Adding 20 g of the sample to 200 ml desalinated water and shaking it for 1 hour, followed by filtration of the solution. The conductivity is then measured using the filtrated water. The correction of temperature is automatically done in the measuring device. The electrical conductivity is given for a solution at 25°C. The salt content is calculated using the factor 52.8 [mg KCl/l]/[$10^{-4}$/cm] and is given in mg KCl/l. This is based on the conductivity (14.12 * $10^{-4}$ S/cm) of a 0.01 molar KCl solution.

**pH-value DIN ISO 10390 ($CaCl_2$):**

*A minimum of 5 ml of the air-dried sample is placed in a glass vessel. Five times the volume (25 ml) of a 0.01 M $CaCl_2$ solution is added. The suspension is overhead rotated for 1 h. The suspension obtained is directly measured with a pH meter.*

Water content according to DIN 51718:
Method A / two-step method (Reference method for coal)

### Raw moisture

The sample (100 to 1000 g) is spread evenly in a drying bowl crucible, weighed with 0,1 g accuracy and dried in an oven at (40 ± 2) ° C until the mass is constant. If necessary, the sample is divided and dried in more than one crucible.
Analysis: raw moisture (FG) in%

$$FG = \frac{m_E - m_R}{m_E} * 100$$

FG = raw moisture in %
$m_E$ = mass of the sample before drying in g
$m_R$ = mass of the sample after drying in g

### Hygroscopic moisture

Hygroscopic moisture is the moisture held firmly within the pore structure of biochar. Measuring hygroscopic moisture will lead to an understanding of a particular biochar's ability to hold and release moisture.
A subsample of the air-dried and crushed (grain size < 1 mm) sample is weighed immediately after the subsampling into a TGA crucible and is dried in a nitrogen atmosphere at (106 ± 2) ° C to constant mass.
Evaluation: hygroscopic moisture (FH) in %

$$FH = \frac{m_E - m_R}{m_E} * 100$$

FH = hygroscopic moisture in %
$m_E$ = mass of the sample before drying in g
$m_R$ = mass of the sample after drying in g

### Water content

Evaluation: water content (Wt) in %

$$W_t = FG + FH * \frac{100 - FG}{100}$$

$W_t$ = water content in %
FG = raw moisture in %
FH = hygroscopic moisture in %

### Ash content (550 °C) analogue DIN 51719:

To determine the ash content in biochar two programs of the TGA (30 or 60 min) could be used. The weight determination of the crucible is carried out automatically. Enter the sample number for corresponding crucible position. Add 1,0 g of the sample to the ceramic crucible and spread the substance evenly in the crucible. Weighing is done automatically relative to the crucible position.
Runs the following heating program in the oven:
heating with a rate of 5 K / min to 106 ° C under a nitrogen atmosphere to constant mass (Δm <0,05%).

- temperature increase with 5 K / min to 550 ° C under oxygen atmosphere,
- hold this temperature for 30 or 60 min to constant mass (m <0,05%).

The ash content is automatically determined and calculated for the sample used.

### Carbonate $CO_2$ according to DIN 51726

*1 g of pre-dried and ground sample is weighed to 0.2 mg and placed in the decomposition flask. The device consists of an absorption tower, which purges the air of carbon dioxide, the decomposition flask with an attachment to add the decomposition acid and three connected washing bottles. The carbon dioxide freed air is sucked through the system. After the system is purged and the washing bottles are filled with an absorbing solution of $BaCl_2$ and NaOH solution, 30 ml decomposition acid (hydrochloric acid with $HgCl_2$ as a catalyst and a wetting agent) are added to the decomposition flask. The content of the decomposition flask is boiled for about 10 minutes. The inert gas flow transports the carbon dioxide produced through the acidic solution in the first wash bottle in the other two wash bottles. In the second wash bottle, the carbon dioxide dissolves under consumption of base and is precipitated as barium carbonate. If something precipitates in the third wash bottle, the measurement must be repeated with a lower initial mass. The consumption of base in the second wash bottle is determined by a pH-titration using hydrochloric acid. The carbonate content of the sample is calculated from the base consumption and is calculated as $CO_2$.*

### CHN according to DIN 51732:

*The use of TruSpec Micro or comparable devices is recommended. The sample is combusted in a stream of pure oxygen. Resulting $CO_2$, $H_2O$ and nitrogen oxides are quantified to calculate the elemental composition.*

### Sulphur according to DIN 51724-3

*The pre-dried and crushed sample is weighed in a ceramic crucible. With the aid of a catalyst layer of $V_2O_5$ and at high temperatures (> 1300 ° C) the sulphur is oxidized in an oxygen stream. The resulting $SO_2$ is detected in an Infrared cell and is calculated with the sample mass as total sulphur content.*

### Oxygen (calculation) according to DIN 51733

*The oxygen content is a parameter derived from calculations. It is assumed that the biochar sample consists essentially of ash, carbon, hydrogen, nitrogen, sulphur and oxygen. If one subtracts the ash, carbon, hydrogen, nitrogen and sulphur content in percent from 100 %, the result will be the oxygen content in percent.*

### $C_{org}$, H/C und O/C (calculation):

Other quantities and ratios can be calculated from the determined data.
$C_{org}$ is derived from the total carbon content minus the inorganic carbon content ($CO_2$) in the sample. The H content is analysed through CHN-analysis (see above).

### PAH according to DIN EN 17503 (extraction method 10.2.3 using toluol)

The toluol extraction time of the PAHs contained in biochar must be six hours.

Trace metals after microwave-assisted digestion according to DIN 22022-2, DIN 22022-7, DIN EN ISO 17294-2 / DIN EN 1483:
(Pb, Cd, Cu, Ni, Hg, Zn, Cr, B, Mn, As, Ag)
*The pre-dried and crushed sample is weighed and placed into the reaction vessel of the microwave. 6 ml of nitric acid, 2,0 ml of hydrogen peroxide and 0,4 ml of hydrofluoric acid are added. The reaction vessel is sealed and is placed in the microwave.*
*Program flow of the microwave pressure digestion:*
*heating (room temperature to 190 ° C) in 15 min*
*holding time at 190 ° C for 20 minutes*
*free cooling*

*additional only for ICP-OES:*
*Program flow of the fluoride masking (Boric acid, adding 5 ml of saturated solution):*
*heating (room temperature to 160 ° C) in 8 minutes*
*holding time at 160 ° C for 7 minutes*
*free cooling*
*After complete cooling, the reaction vessels are opened, and the digestion solution is transferred to in a 50 mL plastic volumetric flask and filled with deionized water.*
*The diluted solution is measured by ICP-MS (DIN EN ISO 17294-2).*
*To determine the levels of mercury DIN EN ISO 12846, DIN 22022-4; DIN EN ISO 17294-2, and DIN 22022-7 can be used.*

Main elements after melting digestion DIN 51729-11, DIN EN ISO 11885 / DIN EN ISO 17294-2: (P, Mg, Ca, K, Na, Fe, Si, S)
*The melting process is performed on the ashes of the biochar. 200 mg of the fine ash are weighed into a platinum crucible and thoroughly mixed with 2 g of lithium metaborate.*
*The platinum crucible is placed in a digestion oven. The digestion remains at least 15 minutes at 1050 ° C in the oven. The melt is dissolved in hydrochloric acid and filled to 500 ml.*
*The samples are measured with ICP-OES (DIN EN ISO 11885) or ICP-MS (DIN EN ISO 17294-2).*

Declaration of the nutrient content
The content of nitrogen, phosphorous, magnesium, calcium and potassium must be stated in g $kg^{-1}$ of nitrogen, $P_2O_5$, MgO, CaO and $K_2O$, respectively, referring to dry matter of biochar. It is recommended to provide all main elements (for P, Mg, Ca, K additionally) as g $kg^{-1}$ (element, not oxide) and the results of elemental analysis and calculation (CHNSO, $C_{org}$, carbonate) in % of dry matter of biochar.

Water holding capacity (WHC) according to DIN EN ISO 14238, annex A
Water-holding capacity. This can be measured using the method E DIN ISO 14238, annex A. The test consists of soaking the 2mm fraction of the material in water for a period of 24 hours. After this, the material should be placed on a dry sand bed for 2 hours for removing free water. The saturated material should then be weighed and then dried at 40°C in a compartment dryer. After drying the material should be weighed again to estimate the water holding capacity.

### Electrical conductivity of the pyrogenic solid

To determine the conductivity of the solid biochar, it is first necessary to compress the finely ground biochar under standardized pressure. During this compression process, the electrical resistance is then measured vertically through the test specimen. Based on the measured resistance of the biochar and the geometry of the compacted matter, the specific conductivity can be determined using the following formulas:

$$\Omega specific = \Omega electric * \frac{A}{h}$$

$$LF = \frac{1}{\Omega specific * 1000}$$

$\Omega$specific = specific resistance in Ohm $*$ cm
$\Omega$electric = electric resistance in Ohm
A = Area of the compressed biochar = contact area of the electrode in cm2
H = Height of the compressed biochar in cm
LF = Conductivity in mS/cm

For the determination of the conductivity, a device for compressing the biochar, a multimeter with the capability of 4-wire measurement and a measuring construction in which the biochar can be compressed and the electrical resistance can be measured at the same time are required. The measuring construction consists of a pressure flask whose bottom and lid each consist of corresponding copper electrodes. The electrodes used are to be connected to an external multimeter.
In an exemplary setup, for example, a sample chamber volume of 10 cm³ results in a relevant weighing range of 1-2 g of a sample dried at 40 °C and finely ground for analysis. A pressure in the range of 10 - 50 kN must be applied to this test setup using a hydraulic press (e.g., toggle press). When the specified target pressure is reached, the resistance is immediately read on the multimeter and converted using the above formulas. The average conductivity is obtained from the mean value of the solid conductivities under 10, 20, 30, 40 and 50 kN pressure.

This method was developed by the Ithaka Institute and Eurofins. The necessary measuring equipment can be obtained from Eurofins. The establishment of an ISO standard for this measurement method is currently being attempted.

# Annex 2

## Analytical Parameters for EBC-FeedPlus and EBC-Feed

The current issue date of the respective standard applies in each case. Further descriptions in this annex may contain deviations and/or concretizations with regard to the mentioned standard. The explanations in italics are only intended to provide the reader with basic information; the implementation is based exclusively and precisely on the standard referred to.

### Trace metals *As, Pb, Cd, Hg*

DIN EN 15763

For microwave digestion, 0.1 g to 1 g of the dried, ground, and homogenized material is weighed into a plastic cup (PTFE, PFA) or quartz cup. After addition of 65% nitric acid in a ratio of 1+5 (sample+acid) and after addition of 30% hydrogen peroxide in a ratio of 1+2.5 to 1+10 (sample+hydrogen peroxide), digestion is performed at the maximum permissible temperature for the system (usually 190°C). Heating phase: 15 min; holding time: 30 min. After cooling, transfer quantitatively to a polypropylene vessel with volume marker and fill it to the mark with 0.1 M nitric acid. The measurement is carried out by ICP-MS or ICP-OES. For mercury, cold vapor AAS or atomic fluorescence spectrometry are used.

### PCB

DIN EN 16167, DIN EN 16215

The material is crushed into powder (<1 mm) and dried at a maximum of 35 ° C. Alternatively, it can be dried chemically or by freeze-drying. 5-10 g of sample are extracted by Soxhlet extraction with toluene for 6 h with the addition of suitable internal standards. Alternatively, an ASE extraction can be used. The extract is concentrated and purified according to VDLUFA VII 3.3.2.2 with silica gel column chromatography. The quantification of the purified extract is done with GC-MS or GC-ECD.

### *PCDD/PCDF/coplanar PCB*

DIN EN 16190, DIN EN 16215, Commission Regulation (EC) No 152/2009 (modified by No 2017/771) - HRGC/HRMS method

*The material is crushed into powder (<1 mm) and dried at a maximum of 35 ° C. Alternatively, freeze-drying can be used. After the addition of isotope-labeled standards, 2 g of sample material are extracted with toluene in a Soxhlet for 20 h. Alternatively, special hot extractors such as the ASE can be used. After concentration, the extract is purified by multiple column chromatography and can be divided into different fractions. At this point it is also possible to obtain the DIN-PCB fraction. Finally, the components are measured with GC-HRMS.*

### Fluor

VDLUFA III 17.3.2, VDLUFA VII 2.2.2.1, DIN EN 16279 (ion selective electrode; according to VDLUFA VII 2.2.2.1), BAFU F-7 2017 (DIN 38405-4)

*The dried and ground material is ashed and digested with sodium hydroxide. The cooled digestion is dissolved in hydrochloric acid with the addition of a complexing agent (TISAB). A pH value of 5.5 is then adjusted and the fluoride content is determined using an ion-sensitive electrode.*

### Dry matter

**Permitted test methods: dry matter: DIN 51718; VDLUFA III 3.1;**

A minimum of 50 g of the sample is taken and crushed as necessary, avoiding changes in moisture content. 5 g of biochar are weighed (±1 mg) and dried at 103°C for 4 h. After loading the oven, the drying time does not start until 103°C has been reached exactly. After cooling in the desiccator, it is weighed back (±1 mg).

### Crude ash

**Permitted test methods:** analog **to DIN 51719, VDLUFA III 8.1; HCl-insoluble ash: VDLUFA III 8.2**

Approximately 5 g of sample is weighed to the nearest 1 mg into an annealed and tared ashing dish. The dish is placed in a muffle furnace and left at 550°C±5°C until no char particles are visible. After cooling in the desiccator, the sample is weighed back to 1 mg. For difficult samples, ammonium nitrate treatment is carried out according to method VDLUFA 8.1.

# Annex 3
# Additional Parameters

The current issue date of the respective standard applies in each case. Further descriptions in this annex may contain deviations and/or concretizations with regard to the mentioned standard. The explanations in italics are only intended to provide the reader with basic information; the implementation is based exclusively and precisely on the standard referred to.

Gross calorific value / net calorific value according to DIN 51900:
*To determine the calorific value a bomb calorimeter which fulfills the requirement of the stated standard is used. 0,3 to 0,8 g of pre-dried and ground sample is weighed into a combustion bag, capsule, or crucible. The sample is mounted in the combustion bomb with an ignition wire and 10-20 ml of eluent in bottom part of the bomb. The bomb is placed into the calorimeter. The oxygen filling, the ignition and the measurement are done automatically. After combustion the bomb must be checked for signs of incomplete combustion. The gross calorific value is calculated using the calibration and measurement data. With further corrections, the net calorific value is calculated.*

Ash content (815 °C) DIN 51719:
*The ash content at 815 ° C is determined after determining the ash content at 550 ° C by rising the temperature from 550 ° C with 5 K / min to 815 ° C and holding until constant weight (mass difference ± 0,05%) is reached.*

Volatile matter according to DIN 51720:
*1,0 g of the pre-dried and ground sample is placed into a crucible (with lid). The sample must form a uniformly thick layer on the bottom of the crucible. The crucible is placed in the oven preheated at 900 ± 5 ° C. After 7 minutes (± 5 sec), the crucible is removed from the oven and reweighed after cooling to room temperature. The volatile matter content is calculated from the mass loss of the sample.*

Thermogravimetric analysis (TGA):
The TGA curve is determined, similar to how the ash content is measured, with the TGA. For this purpose, 1,0 g of pre-dried and ground sample is weighed in the TGA crucible. During the temperature rise from 30 ° C to 950 ° C with 10 K / min, the crucible is weighed at frequent intervals in the TGA furnace. The result is shown graphically.

PCB
VDLUFA VII 3.3.2.2 (DIN-PCB; hot extraction, GC-MS) DIN EN 16167 (use extraction method 2 with Toluol and not with light petroleum), DIN 38414-20 and DIN EN 16215
The sample is crushed into powder (<1 mm) and dried at a maximum of 35 ° C. Alternatively, it can be dried chemically or by freeze-drying. 5-10 g of sample are extracted by Soxhlet extraction with toluene for 6 h with the addition of suitable internal standards. Alternatively, an ASE extraction can be used. The extract is concentrated and purified

according to VDLUFA VII 3.3.2.2 with silica gel column chromatography. The quantification of the purified extract is done with GC-MS or GC-ECD.

PCDD/PCDF/coplanar PCB according to DIN EN 16190:2019-10, DIN EN 16215, Commission Regulation (EC) No 152/2009 (modified by No 2017/771) HRGC/HRMS method
The sample is crushed into powder (<1 mm) and dried at a maximum of 35 ° C. Alternatively, freeze-drying can be used. After the addition of isotope-labeled standards, 2 g of sample material are extracted with toluene in a Soxhlet for 20 h. Alternatively, special hot extractors such as an ASE can be used. After concentration, the extract is purified by multiple column chromatography and can be divided into different fractions. At this point it is also possible to obtain the DIN-PCB fraction. Finally, the components are measured with GC-HRMS.

Specific surface area according to DIN ISO 9277 (BET) and DIN 66137 (density)
The samples should be dried at 40°C and milled to a particle size < 3.15 mm. Nitrogen is used as the adsorption gas. Degassing temperature and time are set to 150°C and 2 hours. The degassing has to be done under vacuum. The multipoint BET method should be applied.

Chrom(VI)
DIN according to EN 16318: 2016-07
*Chromium cannot be oxidized during pyrolysis and is instead reduced during pyrolysis, i.e., Cr(VI) is converted into less mobile and dramatically less toxic Cr(III), which is already regulated as the total Cr content of biochar. Nevertheless, this method is offered to provide analytical evidence of compliance with the requirements of the EU Fertilizer Product Regulation, if required.*

Particle size distribution
Particle size distribution is determined by sieving according to DIN 66165 or ASTM D2862, based on local preferences and equipment availability. *For this purpose, suitable sieves with ascending mesh sizes are stacked on top of each other. The sample is placed on the uppermost, widest-meshed sieve, and then the apparatus is operated for a defined time so that the biochar is sieved dry by shaking or shaking and tapping. After that, the oversize on each sieve is weighed.*
Biochar that has been pre-sieved to less than 2 mm or ground appropriately can also be analyzed for particle size distribution using laser diffraction according to ISO 13320. The specifications of the instrument must be adhered to so that the technically largest possible biochar particles can also still be measured.

# Annex 4

## A4.1 Representative sampling

In order to obtain a biochar sample as representative as possible (in terms of accuracy and precision), a batch must be sampled within the first seven days of production according to the following exact methodology. An incremental cross-stream sampling guarantees the most representative sampling of the product.

### A. Pyrolysis systems with continuous production

1. On three consecutive days, 8 samples of 3 liters each are taken at intervals of at least one hour directly at the discharge of the freshly produced material. This sampling can also be done by an appropriately adjusted automated cross-stream sampler.
2. The 24 subsamples are combined to form a composite sub-sample.
3. The taking of each of the 24 samples (= 3 x 8 daily samples) as well as the homogenisation and sample division must be documented with the exact sampling times in the sampling protocol delivered by the inspection body (bio.inspecta).

### B. Systems with non-continuous production processes

1. The quantity of biochar from which a representative sample is to be taken from must be at least equal to the production volume of one day.
2. The biochar pile to be sampled must first be thoroughly mixed by moving it from one pile to another three times with a front loader or shovel.
3. At 24 different spots of the pile, samples of 3 liters each are taken.
4. The 24 subsamples are combined to form a composite sub-sample.
5. The sampling has to be documented in the sampling protocol delivered by the inspection body (bio.inspecta).

C. Homogenizing and dividing of the sample

The mixed sample of 24 x 3 liters = 72 liters can either be sent directly to the accredited laboratory where it shall be homogenized and divided into a representative analytical sample or the company proceeds as follows to produce a small representative analytical sample on its own.

1. If the particle size of the composite sub-sample is larger than 3 mm, it should be milled to < 3 mm, otherwise no representative sample division is possible.

2. The milled composite sub-sample is either divided by a mechanical sample divider to 2 to 2,5 l or homogenized according to the following instructions:
3. The milled composite sub-sample (total 72 liters) is poured onto a clean surface and then shoveled three times from one pile to another.
4. A sub-sample of 1,5 l is then taken at 15 spots in the mixed pile.
5. The 15 subsamples are again poured together.
6. The new 22,5 l subsample has than to be homogenized thoroughly by turning and piling it 3 times upside-down.
7. From the mixed pile of the 22,5 l subsample, 15 subsamples of 150 ml each shall now be taken at 15 different spots in the pile and united.

The samples to be sent to the accredited laboratory have to be labelled with the QR code generated on the EBC website.

The expected uncertainties in regard to accuracy and precision were described in detail by Bucheli et al. [40] and will be taken into account by the EBC when evaluating the results. The aim of the prescribed sampling method is to achieve a well characterized cross-sectional sample.

# A5. Country Annex: Sweden

The Swedish appendixconsiders Swedish legal requirements and relevant Swedish certificates regarding limit values for potential pollutants. The Swedish appendix overrules the respective EBC limit values as presented below.

EBC-certified biochar that is sold on the Swedish market must meet all requirements of the respective application class of the European Biochar Certificate and the Swedish annex. The Swedish annex applies together with European Biochar Certificate, is an addition to the EBC, and shall therefore not be read as a standalone document.

## A5.1 List of requirements EBC Swedish appendix

The deviations and additions from/to European Biochar Certificate, made in the present Swedish appendix, concern only the application classes EBC-Agro and EBC-AgroOrganic.

## A5.2 EBC-Agro

EBC sets limit values for lead (Pb) and cadmium (Cd) but, for EBC-certified biochar sold on theSwedish market, these limit values are replaced according to the table below.

| EBC-reference | Analysis parameter | Value | Comment / reference |
|---|---|---|---|
| Chapter 7.6 | Lead (Pb) | 100 mg $kg^{-1}$ (DM) | Limit value taken from SNF1998:944 and industry standard SPCR152. |
| Chapter 7.6 | Cadmium (Cd) | 1 mg $kg^{-1}$ (DM) | Guide value taken from EU-Ecolabel, industry standard SPCR 120 and SPCR 152 |

# A6. Country Annex: Austria

The annex for Austria considers the current Austrian quality standard for biochar as defined by ÖNORM S 2211. This annex overrules the respective EBC limit value as presented below.

Biochar that is sold with an EBC-certificate on the Austrian market must meet all requirements of the respective EBC application class plus the Austrian annex. The Austrian annex applies together with European Biochar Certificate (EBC), is an addition to the EBC, and shall not be read as a standalone document.

## A6.1 List of requirements for EBC country annex Austria

The deviations and additions from/to the EBC in the present Austrian annex concern only the application class EBC-Agro.

## A6.2 EBC-Agro

EBC sets a limit value for lead (Pb) but, for EBC-certified biochar sold on the Austrian market, this limit value is replaced according to the table below.

| EBC-reference | Analysis parameter | Limit value | Comment / reference |
|---|---|---|---|
| Chapter 7.6 | Lead (Pb) | 100 mg $kg^{-1}$ (DM) | Limit value taken from ÖNORM S 2211 |

# A7. Country Annex: Switzerland

Switzerland was the first country in Europe to authorize biochar applications in agriculture. At this early stage with limited scientific backing, the precautionary principle led the Swiss authorities to stricter thresholds for certain parameters than today's EBC limit values. The present annex A7 of the EBC overrules the respective EBC limit value as presented below.

Biochar that is sold with an EBC-certificate on the Swiss market must meet all requirements of the respective EBC application class plus the Swiss annex. The Swiss annex applies together with European Biochar Certificate (EBC), is an addition to the EBC, and shall not be read as a standalone document.

## A7.1 Authorized feedstock for biochar production for the application classes EBC-Agro and EBC-AgroOrganic

The "Requirements and regulations for the approval of biochar" issued by the Federal Office of Agriculture (FOAG) stipulate that only untreated woody feedstock is authorized to produce biochar for agricultural applications (EBC-Agro, EBC-AgroBio).

## A7.2 PAH limit value for the application classes EBC-FeedPlus, EBC-Agro, and EBC-AgroOrganic

According to the Swiss Ordinance on Risk Reduction related to Chemical Products (ChemRRV [13]) a limit value of 4 mg $kg^{-1}$ DM applies to the sum of 16 EPA-PAH. This threshold applies also for all biochar that may be used in agriculture. This limit value does, thus, not only apply for EBC-Agro and EBC-AgroOrganic but also for EBC-FeedPlus.

The very low limits of 4 mg Σ16 EPA PAHs per kg of biochar (DM) are extremely difficult to analyse and can only be assured at a 50% accuracy which implies an accuracy of ± 2 mg $kg^{-1}$ (DM).

| EBC-reference | Analysis parameter | Value | Certification classes | Comment / reference |
|---|---|---|---|---|
| Chapter 7.12 | Σ16 EPA PAHs | 4 mg $kg^{-1}$ ± 2 mg $kg^{-1}$ (DM) | EBC-FeedPlus, EBC-Agro, EBC-AgroOrganic | Limit value refered to Chemikalien Risikoverordnung 814.81, Bern 2022 |

## A7.3 Threshold for Cadmium content in EBC-Agro certified biochar

EBC sets a limit value for cadmium (Cd) but, for EBC-certified biochar sold on the Swiss market, this limit value is replaced according to the table below.

| EBC-reference | Analysis parameter | Limit value | Comment / reference |
|---|---|---|---|
| Chapter 7.6 | Cadmium (Cd) | 1 mg $kg^{-1}$ (DM) | Limit value refered to Chemikalien Risikoverordnung 814.81, Bern 2022 |

### A7.4 Further requirements and regulations

Please consult the FOAGs regulations for biochar production under the following link:
https://tinyurl.com/39wsdfph

## A7. Country Annex: Denmark

The annex for Denmark considers the Danish Ordinance on the use of waste for agricultural purposes (Bekendtgørelse om anvendelse af affald til jordbrugsformål, BEK nr 1001, 27/06/2018). This annex defines the application of EBC BasicMaterials biochar in Danish agriculture considering that:

1. the requirements of BEK nr 1001 are fully met,
2. levels of PAHs in biochar are compliant with EBC-Agro,
3. the biochar is labeled as specified in this annex.

The regulation BEK nr 1001 allows the application of defined, sanitized wastes in agriculture, gardening, and forestry. In an advisory opinion[3] the Danish Environmental Protection Agency[4] concluded that pyrolysis at a minimum temperature of 500 °C for a minimum of 3 minutes fulfills the criteria for sanitization. Still, the pyrolysis product in this specific case is legally still considered a waste. Its application to agricultural soil is regulated by BEK nr 1001, which defines limit values for potentially toxic elements in pyrolysis feedstock and in the soil prior to application.

This annex is optional and only applicable to biochars for the Danish market that are produced from manure, sludge from ponds and aquaculture, municipal organic waste, municipal sewage sludge, digestates, industrial sewage sludge, and animal by-products. Any biochar produced exclusively from biomasses not included in the above list shall only be sold for agricultural applications when certified as EBC-Agro, EBC-AgroOrganic or EBC-FeedPlus as specified in the main document of the European Biochar Certificate (EBC).

The Danish annex applies together with EBC, is an addition to the EBC, and shall not be considered a standalone document.

### A7.1 Prerequisite for using EBC-BasicMaterial biochar in Danish agriculture

The deviations and additions from/to the EBC certification guidelines in the present Danish annex concern the labelling and intended use of EBC-BasicMaterials, which fulfil the criteria specified below.

### A7.1a Permissible biomass

This annex only applies to biochars produced in whole or in part from the following feedstocks (feedstock identifiers / ID refer to the EBC Positive list of permissible biomasses for the production of biochar):

[3] A „vejledende udtalelse“ published by “Miljøstyrelsen” (Danish Environmental Protection Agency), which is part of the Miljøministeriet (Danish Ministry for the Environment), is an interpretation of the already existing, relevant set of rules and only indicative. It has no legal effect.
[4] „Pyrolyse som metode til kontrolleret hygiejnisering iht. affald til jord- bekendtgørelsen“, Danish Environmental Protection Agency (J.nr. 2021-60803, Ref. CASCG, June 22, 2022)

- manure (feedstock-ID AB-02)
- sludge from ponds/aquaculture (feedstock-ID WW-02 or AB-03)
- municipal organic waste (feedstock-ID R-10)
- municipal sewage sludge (feedstock-ID WW-01)
- digestates and industrial sewage sludge (feedstock-ID WW-02, AD-01 – AD-04)
- animal by-products (feedstock-ID AB-01, AB-03)

### A7.1b Limit values for potentially toxic elements (PTE) in biochar

EBC does not include limit values for potentially toxic elements for EBC-BasicMaterial. However, for use in Danish agriculture, the limit values for PTE listed in Table 1 must not be exceeded.

*Table 7.1: Limit values for EBC-BasicMaterials biochar to be used in Danish agriculture according to the Danish Annex to the European Biochar Certificate. ($P_{tot}$ = total phosphorous, dm = dry matter)*

| EBC-reference | Analysis parameter | Limit value | Comment / reference |
|---|---|---|---|
| Chapter 7.6 | Lead (Pb) [1] | 5000 mg $kg^{-1}$ $P_{tot}$ | BEK nr 1001, Annex 2 |
| Chapter 7.6 | or Lead (Pb) | 60 mg/kg $kg^{-1}$ DM | BEK nr 1001, Annex 2 |
| Chapter 7.6 | Cadmium (Cd) | 100 mg $kg^{-1}$ $P_{tot}$ | BEK nr 1001, Annex 2 |
| Chapter 7.6 | or Cadmium (Cd) | 0,8 mg/kg $kg^{-1}$ DM | BEK nr 1001, Annex 2 |
| Chapter 7.6 | Copper (Cu) | 1000 mg $kg^{-1}$ DM | BEK nr 1001, Annex 2 |
| Chapter 7.6 | Nickel (Ni) | 2500 mg $kg^{-1}$ $P_{tot}$ | BEK nr 1001, Annex 2 |
| Chapter 7.6 | or Nickel | 30 mg $kg^{-1}$ DM | BEK nr 1001, Annex 2 |
| Chapter 7.6 | Mercury (Hg) | 200 mg $kg^{-1}$ $P_{tot}$ | BEK nr 1001, Annex 2 |
| Chapter 7.6 | or Mercury (Hg) | 0,8 mg $kg^{-1}$ DM | BEK nr 1001, Annex 2 |
| Chapter 7.6 | Zinc (Zn) | 4000 mg $kg^{-1}$ (DM) | BEK nr 1001, Annex 2 |
| Chapter 7.6 | Chromium (Cr) | 100 mg $kg^{-1}$ (DM) | BEK nr 1001, Annex 2 |
| Chapter 7.6 | Arsenic (As)[1] | 25 mg $kg^{-1}$ (DM) | BEK nr 1001, Annex 2 |

[1]: For lead and arsenic, BEK nr 1001 defines two different limit values; The stricter limits for home garden applications are applied in this annex.

### A7.1c Limit values for polycyclic aromatic hydrocarbons (PAH) in biochar

EBC defines a limit value of 4 mg $kg^{-1}$ for the 8 EFSA PAH for EBC-BasicMaterial. However, for use in soil according to this annex, levels of PAHs in biochar must be compliant with EBC-Agro, i.e.:

- Limit value of 6±2.4 mg kg for the 16 EPA PAH, and
- Limit value of 1 mg kg-1 for the 8 EFSA PAH

must not be exceeded. For more information on this topic, see Chapter 7.12 of the EBC guidelines.

### A7.1d Limit values for the feedstock

According to the advisory opinion of the Danish Environmental Protection Agency, the limit values for potentially toxic elements are to be applied to the feedstock in its initial state. In principle, most trace elements are not volatile in pyrolysis and thus accumulate through mass loss in pyrolysis. However, others, such as mercury, and to a certain extent also cadmium, are volatile, so that an analysis of the biochar does not provide sufficient information about the feedstock. Therefore, the biochar feedstock must also be analyzed in accordance with national requirements to demonstrate compliance with the following limit values. If feedstocks are mixed, e.g., when sewage sludge from different wastewater treatment plants is treated in a single pyrolysis plant, the different sewage sludges must be examined individually according to the relevant standards for sewage sludge analysis.

*Table 7.2: Limit values of feedstock to produce EBC-BasicMaterial biochar to be used in Danish agriculture according to the Danish Annex to the European Biochar Certificate. ($P_{tot}$ = total phosphorous, DM = dry matter) Limit values apply for individual feedstock prior to mixing feedstock from different sources.*

| Analysis parameter | Limit value | Comment / reference |
|---|---|---|
| Lead (Pb) [1] | 10000 mg $kg^{-1}$ $P_{tot}$ | BEK nr 1001, Annex 2 |
| or Lead (Pb) | 120 mg/kg $kg^{-1}$ DM | BEK nr 1001, Annex 2 |
| Cadmium (Cd) | 100 mg $kg^{-1}$ $P_{tot}$ | BEK nr 1001, Annex 2 |
| or Cadmium (Cd) | 0,8 mg/kg $kg^{-1}$ DM | BEK nr 1001, Annex 2 |
| Copper (Cu) | 1000 mg $kg^{-1}$ DM | BEK nr 1001, Annex 2 |
| Nickel (Ni) | 2500 mg $kg^{-1}$ $P_{tot}$ | BEK nr 1001, Annex 2 |
| or Nickel | 30 mg $kg^{-1}$ DM | BEK nr 1001, Annex 2 |
| Mercury (Hg) | 200 mg $kg^{-1}$ $P_{tot}$ | BEK nr 1001, Annex 2 |
| or Mercury (Hg) | 0,8 mg $kg^{-1}$ DM | BEK nr 1001, Annex 2 |
| Zinc (Zn) | 4000 mg $kg^{-1}$ (DM) | BEK nr 1001, Annex 2 |
| Chromium (Cr) | 100 mg $kg^{-1}$ (DM) | BEK nr 1001, Annex 2 |

### A7.2 Labelling of the product

Biochar certified as EBC-BasicMaterial for the Danish market that fulfills the criteria as detailed in A7.1 may be sold for the use in agriculture. However, the application is restricted according to the regulation BEK nr 1001. This includes:

- Maximum application rate of 7 tons of dry matter per hectare per year, calculated as a 10-year average in agriculture and 15 tons per year in parks, forests and where no perishable crops are grown.
- Only to be applied on soils not exceeding the trace metal content specified in annex 4 of BEK nr 1001

Therefore, a clear reference on the packaging and/or delivery bills and accompanying documents is mandatory:

"only *for soil application in Denmark according to BEK nr 1001*"

The notice may be linguistically adapted and should be noted in Danish and English. Furthermore, the rules of chapter 12 of the EBC (Labeling and Advertising with EBC Certification) do apply.

**From:** Dennis Kiley
**To:** Maine Climate Council
**Subject:** Feedback on 2024 Climate Action Plan Draft
**Date:** Tuesday, October 22, 2024 2:17:00 PM



To Whom It May Concern,

To begin, thank you to all members of the Climate Council and supporting team members. Having been a member of the Community Resilience Working Group, I recognize that so much work has gone into this process and I'm excited about the draft you've created. I have two notable pieces of feedback.

1. While the importance of communication is mentioned throughout the draft- and was highlighted often by different working groups and in other meetings- I don't see any tangible suggestions for how this will be skillfully implemented. In our working group deliberations, we discussed the need for communication strategies and trainings so that all people engaging in climate work (state, municipal and community leaders) can be most effective talking about the issues with different constituencies. Without concrete and concerted efforts, I fear the success of these efforts will be reduced. People recognize the importance of this topic but peripheral and tangential references will not create a coordinated and cohesive plan that actually ensures climate communications are done effectively. Therefore, somewhere in the final report, I believe the Council should make explicit the need for more communication resources, supports and actions.
2. As with communication, the interdisciplinary nature of climate change was frequently cited in meetings of the Council, working groups and with the public at large. This reality makes climate action both more difficult, and also allows for targeted actions at different leverage points that can lead to positive outcomes for multiple issues we care about. For example, job creation and mental health. I hope the Council's final report will make distinct mention of both the interdisciplinary circumstances we face, and also the need for a subsequent integrated and collaborative across "agencies"

Thank you for your considerations as well as all the great work that has gone into the draft.

Sincerely,
Dennis
"Psychology in service to healing and health, regeneration and resilience"
Denniskiley.com

**From:** noreply@informe.org on behalf of Office of Policy Innovation & Future
**To:** Siegel, Amalia; Maine Climate Council
**Subject:** Webform submission from: Contact the Maine Climate Council
**Date:** Tuesday, October 22, 2024 4:56:47 PM



Submitted on Tue, 10/22/2024 - 16:56

Submitted by: Anonymous

Submitted values are:

**My comments are about:**
Maine Climate Action Plan - Update DRAFT

**First name**
Susanne

**Last name**
Lee

**Email**
susanne.lee@maine.edu

**Town/City**
Orono

**Affiliation/Company**
University of Maine - Sen. George J. Mitchell Center for Sustainability Solutions

**Job title**
Faculty Fellow

**Message**
Thank you for the opportunity to provide feedback on the Maine Climate Action Plan Update DRAFT!

Based on working on the Materials Management Task Force to draft recommendations for this update, I wanted to point out some key high impact MM/climate-related actions not included in the draft.

Food Waste Awareness Education - According to the research, the most cost-effective and essential solution for ending food waste is basic education (e.g. knowing that 40% of the food that we produce is never eaten while 1 in 5 Maine children suffer from hunger or that the average Maine family could save almost $2000 per year which is currently spent on food that is wasted or lost) because people need to understand why they should care to take action to

stop food waste. Without the "why", people will not understand why they should change their behavior or take action to prevent, recover or compost wasted food. In addition, most people do not understand the growing connection between food waste and methane production as the "emergency brake on climate change" but this insight alone would certainly increase food waste reduction among the climate concerned. Basic food education, including growing food, nutrition/hunger, cooking food, and food waste, should be a basic part of school edu cation and is an essential solution for reducing food waste.

SMART/PAYT Materials Management Programs for municipalities - these proven effective programs which provide a financial incentive for households to reduce their waste streams are an essential methane reduction strategy since both food waste and recycled product waste would be reduced. The town of Sanford is a clear example of the benefits of a PAYT or SMART program for dramatically reducing the town's waste and therefore methane production immediately after implementation. It not only reduces HH waste, but it also creates a revenue stream that municipalities can use to create additional community benefits.

Hopefully all three of these missing but proven-effective elements can be added to the update. The most critical is education which will not only create immediate short-term impact but is essential for long-term sustainable change.

Prevent business-mandated disposal (vs. donation) of perfectly good, edible food: Another basic and common sense strategy for reducing food waste, while also addressing hunger, is to prevent businesses from requiring employees to dispose of perfectly good, edible food that could be given to employees or donated to charity - this practice is quite common and should be stopped. Sadly, many businesses feel that it is easier, better to dispose of good, edible food than to take the time to provide for donation or give to employees.

Maine Climate Council
Governor's Office of Policy Innovation & the Future
181 State House Station
Augusta, Maine 04333

October 22, 2024

**RE: Maine Audubon's Comment on the October 15 Draft of Maine's Climate Action Plan**

Dear Members of the Maine Climate Council:

Thank you for your time, energy, and dedication to updating Maine's Climate Action Plan to meet the urgency that science demands. Throughout the past year, Maine Audubon has been deeply involved in the process of developing updated recommendations for your consideration, focusing primarily on reviewing the goals of the Natural and Working Lands Working Group. Like you, we are committed to advancing a strong Climate Action Plan that prioritizes measurable action and equitable outcomes.

Upon reviewing the draft update to Maine Won't Wait on October 15, we would like to highlight several inclusions *and* omissions from the original Natural and Working Lands Working Group's (NWLWG) recommendations that are critically important to us meeting our goals. As we reflect on a year of drastic climate impacts, we encourage you to support the following recommendations for Strategy E: *Protect Maine's Environment and Natural and Working Lands and Waters*:

**INTENTIONAL LAND CONSERVATION**

It matters what land we conserve and how we conserve it. In the working group's formal recommendations, the NWLWG reiterated our support for focusing land protection efforts on areas with high biodiversity value. We are in the midst of a biodiversity crisis. The Science and Technical Subcommittee's 2024 Update describes how climatic changes are escalating in both scope and scale, with massive ramifications for wildlife. Not only have the four years since the first report each ranked among the top ten warmest on record, but the global loss of biodiversity has accelerated, with the first documented extinctions due directly to climate change and projections for the mass spread of invasives and additional extinctions. Here in Maine we are also seeing wildlife declines, with eight new species recently added to the threatened and endangered species list—in part due to climate change—and notable declines in nearly all birds, amphibians, and reptiles, and anecdotal declines in insects overall.

The NWLWG's recommendations offered several specific avenues to help address biodiversity loss which are not fully reflected in the draft plan, such as: *1) Conserving land within the Department of Inland Fisheries and*

*Wildlife's Beginning with Habitat Focus Areas of Statewide Ecological Significance; 2) Adding new state and private-owned ecological reserves (including high carbon forests), and 3) Increasing fee and easement conservation for important terrestrial and aquatic areas that ensure landscape-level connectivity as identified through efforts such as a new statewide landscape conservation blueprint.*

Both Beginning with Habitat areas and Ecological Reserve lands represent two key, existing programs that offer clear guidance identifying lands to conserve that have high biodiversity value. In order to explicitly address this item, we suggest the following edits (underlined) be included within the **bolded** sub-bullets of Recommendation 1 (p. 35):

> Focus on areas that are [1)] richly biodiverse[, such as Beginning with Habitat Focus Areas of Statewide Ecological Significance], [2)] have high potential to draw back and store carbon[, such as Ecological Reserves], [3)] are culturally and economically important, and/or [4)] that can improve equitable public access.

Secondly, we are pleased that the Draft Plan recommends convening a statewide process to help prioritize landscape-level connectivity for important habitat types by the end of 2025. However, we believe that this initiative should be specifically referenced within the relevant **bolded** sub-bullet of Recommendation 1 (p. 35):

> Restore and increase the resilience of coastal, marine, and inland habitats, prioritizing areas that connect to already conserved lands and waters and promote ecosystem connectivity and health~~.~~ [as identified through efforts such as a new statewide landscape conservation blueprint.]

Such a blueprint would help balance the competing land needs in Maine, which are best considered together rather than in isolation. Developing a strong and comprehensive landscape conservation blueprint that outlines the most important places for habitat, biodiversity, and ecological resilience would serve as a valuable tool toward the prudent and targeted deployment of resources. According to the NWLWG's formal recommendations, *"a landscape conservation blueprint would allow for "a collaborative process to unfold for setting goals to and beyond 2030 for the conservation and management of key places for biodiversity, recreation, and ecosystem services (drinking water, timber products, etc.) in the broader context of land use in Maine's natural and working lands while respecting individual management objectives of private landowners."*

**LAND FOR MAINE'S FUTURE (LMF)**

We support establishing a permanent funding source for the LMF program. Additionally, we suggest that this specific recommendation be included within the **bolded** sub-bullets of Recommendation 1 (p. 35). The existing bullet could be easily edited to include this essential component as intended by the working group:

> Significantly expand the funding and eligibility for fee and easement acquisition through existing and new land conservation programs, including [identifying a permanent funding source for] the Land for Maine's Future Program.

LMF is Maine's most successful land conservation program. As detailed within the Draft Plan, we know we need to increase the rate of conservation fivefold in order to reach our goal of conserving 30% of land in Maine by 2030. We cannot do this without securely funding LMF into the future. Additionally, the NWLWG identified that this permanent funding source should be established by December 2025 and generate at least $50 million/year. Including this date and figure will help solidify the urgency and scale of this unanimously supported recommendation.

**CAPACITY AND COLLABORATION**

In order to fully achieve Strategy E of our state's climate plan, we must plan diligently beyond the 2030 goals, which will undoubtedly require additional capacity. We cannot accomplish our goals if we are not adequately supporting the people we need to do this important work.

While the Draft Plan raises this point, this issue requires further refinement. It is our understanding that nearly all of the agencies tasked with carrying out this important work are understaffed and underpaid. We should not expect them to complete this essential work without adequate support. If we are to reach our collective goal to increase the total acreage of conserved lands in the state to 30% by 2030, Maine's natural resources agencies should have staff and resources to adequately support existing and novel conservation endeavors.

We recommend the following edits be included within the **bolded** sub-bullets of Recommendation 1 (p. 35):

> Expand public and private capacity to support conservation acquisition and stewardship, including [1) ] participatory planning, due diligence, ongoing land management and monitoring, and program evaluation and accountability~~.~~ [and 2) addressing agency staffing retention challenges and ensuring staffing keeps pace with acquisition and land management responsibilities.]

Non-competitive salary levels and position vacancies are hindering our natural resource agencies' ability to do their best work protecting and restoring Maine's natural resources detailed within our state's Climate Action Plan.

Changes are upon us now, here in Maine, as we all know from having experienced hotter days and nights, less snow and ice, warmer waters, and devastating, destructive rainstorms, windstorms, and marine storm surges. Maine Audubon looks forward to remaining engaged and supportive as the Maine Climate Council continues its work to develop and implement a plan to urgently, equitably, and effectively address the climate crisis together.

Thank you for your thoughtful consideration.

Sincerely,

Francesca Gundrum, Director of Advocacy
**Maine Audubon**

September 19, 2024

Maine Climate Council
Governor's Office of Policy Innovation and the Future
181 State House Station
Augusta, Maine 04330

Dear Members of the Maine Climate Council:

Thank you for the time, energy, and attention you have devoted to the Maine Climate Council. For the past several months, Maine Climate Council working groups have been meeting to develop a set of recommendations that will be considered for incorporation into the new Climate Action Plan to be released later this year. Many of our organizations have been deeply involved in that process, and like you, all of us are committed to advancing a strong Climate Action Plan that prioritizes measurable action and equitable outcomes.

In the four years since *Maine Won't Wait* was released, we have made enormous progress by working together. Over that same period, the impacts of climate change have become more pronounced in Maine, causing damage to our infrastructure, harm to our communities, and interruptions to our way of life. There is much work still to be done to achieve the goals contained in *Maine Won't Wait* and actualize a safe and prosperous future for Maine, and this updated Climate Action Plan will play a critical role in guiding us toward that future.

As environmental, social justice, public health, and community organizations that advocate for mitigating and addressing the impacts of climate change, we know from experience that adopting proven clean energy technologies and climate solutions is a practical path forward that will benefit Maine people, our economy, our communities, and our abundant natural resources. Many of the technologies we need to help reduce the pollution-causing climate change already exist and will cost Mainers less than continuing our dependence on polluting sources of energy. At the same time, we need to respond to the opportunities of the clean energy transition and the impacts of climate change by prioritizing our most vulnerable communities.

We are impressed by the recommendations that have emerged from a vast collaborative effort in the first half of this year, and recognize the magnitude of the task of evaluating the information and ideas in front of you. Using our collective climate policy knowledge and shared commitment to making Maine a better place for all people, we have identified several key strategies that we believe to be of utmost importance for inclusion in the final Climate Action Plan this December. Maine's climate response requires major changes across all sectors of society, but these changes represent monumental opportunities to advance our state's economy and increase standards of living for all.

While we are supportive of the current recommendations, we have concerns that some could go further in establishing clear, measurable steps to make the most of the opportunities to improve

health and equity, reduce consumer costs and pollution, and to achieve the statutory emissions reduction mandates established by the same legislation that initiated the Maine Climate Council in 2019. To ensure the recommendations in the Climate Action Plan add up to the 45% reduction required by 2030 and the 80% reduction required by 2050, we urge the Climate Council to quantify the strategies and to set specific metrics based on the forthcoming modeling and projections of what is necessary. It is our hope that this modeling will bolster a quantitative and measurable approach to our statewide climate response.

To ensure continued progress in the face of escalating climate change, it is essential that our updated Climate Action Plan reflects the ambition, urgency, and dedication to proven climate solutions that we have seen in action in communities throughout Maine. Further, it is imperative that our state agencies and governing bodies have the full capacity to enact the recommendations within the Climate Action Plan. While immense progress has been made over the past four years, it is evident that our state agencies may need to be resourced at a higher level to meet the challenges of climate change, and we urge the Climate Council to be explicit in calling for necessary staff capacity.

Our organizations look forward to remaining engaged and supportive as the Climate Council continues its work to develop and implement a plan to urgently, equitably, and effectively address the most existential threat Maine has ever faced.

Thank you for devoting your time, expertise, and important perspectives to this critical effort.

Signed,

*A Climate to Thrive, Acadia Center, Alliance of Maine Health Professionals for Climate Action, Appalachian Mountain Club, Bicycle Coalition of Maine, Maine Audubon, Maine Conservation Voters, Maine Unitarian Universalist State Advocacy Network, Maine Youth Action, Maine Youth for Climate Justice, Natural Resources Council of Maine, passivhausMAINE, Physicians for Social Responsibility, Third Act Maine, and the Union of Concerned Scientists*

**A Climate to Thrive**
Johannah Blackman
*Executive Director*

**Acadia Center**
Peter LaFond
*Senior Advocate and Maine Program Director*

**Alliance of Maine Health Professionals for Climate Action**
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Steve Clemmer
*Director of Energy Research and Analysis*

## Priority Climate Action Plan Strategy Recommendations

*The recommendations listed below are based on recommendations submitted by the Working Groups, but in some cases have been revised to be more actionable, measurable, and ambitious. We encourage the Maine Climate Council to consider these versions of the recommendations as you develop an updated Climate Action Plan to meet the statutory requirements for reducing greenhouse gas emissions through 2050.*

### Transportation

We support the recommendations of the Transportation Working Group, and recognize transportation to be one of the toughest challenges Maine faces in regards to reducing our annual greenhouse gas emissions. The transportation sector accounts for more emissions than any other sector by a large margin, and we are committed to a decarbonization strategy that focuses on the parallel efforts of electrification and reducing vehicle miles traveled.

**Working Group Recommendation: "Set targets for light-duty EV sales that are consistent with Maine's statutory emissions reductions, including targets for purchases by Low-and Moderate Income Households."**

- **Why is this working group recommendation important?**
    - Vehicle electrification is one of the most important ways to reduce emissions from Maine's most polluting sector, and the targets for vehicle electrification set in the 2020 Climate Action Plan were some of the most ambitious contained within *Maine Won't Wait.*[1] In addition to climate benefits, EVs come with many cost savings and health benefits for Maine drivers, and those benefits can only be fully actualized through widespread adoption of a proven technology. Mainers that already drive EVs love them, and commendable efforts by Maine DOT, Efficiency Maine, and other collaborators have led to a robust and expanding public charging network that positions Maine amongst the top states in the country for chargers per capita. Our EV adoption targets will be established by upcoming modeling, and it is our hope that our adoption targets remain ambitious, measurable, and aligned with our decarbonization targets.
    - Low- and medium-income (LMI) drivers have the most to gain from transitioning to EVs due to lower fueling and maintenance costs, but also face the most significant barriers associated with upfront vehicle cost. Setting targets for LMI EV adoption will ensure accountability on the state level for designing programs and incentives that prioritize EV access for LMI drivers.
- **How could this recommendation be improved?**

[1] Maine's Clean Transportation Roadmap states that "although multiple strategies could reduce emissions to near-zero levels, deployment of electric vehicles (EVs) appears to be the most important, technologically ready strategy for almost all modes, due to comparatively low fuel cost, high drive-train efficiency, and sustained falling costs of batteries."

- Maine's 2021 Clean Transportation Roadmap projected that without Advanced Clean Cars II and Advanced Clean Trucks standards, Maine will fall short of our transportation electrification objectives (the first of which, in 2025, is already out of reach). As those policies are not being implemented at present, the Climate Action Plan should identify the policies necessary for Maine to adequately reduce emissions from the transportation sector alongside other sectors to achieve our overarching emissions reduction mandates.
- Ambitious targets should also be set for adoption of medium- and heavy-duty electric vehicles (MHDEVs). The cost savings associated with MHDEV adoption in commercial applications is quickly becoming evident for businesses across the country. With over 225 commercially available MHDEV models in North America, the vast majority of use cases have an electric equivalent that fuels and operates at a lower cost than a combustion engine counterpart.[2] Maine's Clean Transportation Roadmap for Medium- and Heavy-Duty Vehicles will be released in December and will include recommendations informed by extensive market analysis and stakeholder engagement. Maine's 2024 Climate Action Plan update should align with those recommendations and set ambitious adoption targets for MHDEVs in Maine.
- The transition to an electrified transportation sector must be equitable. One way we suggest advancing the dual objectives of maximizing greenhouse gas emissions and helping more Mainers access clean vehicles is by targeting EV rebates, education and outreach to drivers that spend the most on gas each year.

**Working Group Recommendation: "For transportation projects adding new capacity, mitigate modeled greenhouse gas (GHG) increases by investing in modes, projects, and/or programs that offset those modeled emissions."**

- **Why is this working group recommendation important?**
  - As Maine grows and responds to climate change in the coming years, we should do so in a way that does not continue to increase GHGs as we move people and goods throughout the state. To ensure that our emissions from the transportation sector continue to decline over time, all new capacity expansion projects should model GHG impacts, and any increases in emissions should be offset by projects that reduce GHG emissions by a greater amount (such as public transit and active transportation projects).
- **How could this recommendation be improved?**
  - This recommendation should also measure vehicle miles traveled (VMT) and commit to offsetting any increased VMT due to capacity expansion projects. Despite a goal in *Maine Won't Wait* to reduce VMT by 20% by 2030, VMT in

[2] With over 225 commercially available MHDEV models in North America, the vast majority of use cases have an electric equivalent that fuels and operates at a lower cost than a combustion engine counterpart.

Maine continues to rise year over year. As Maine grows and develops in the coming years, we must plan to do so in a way that reduces personal vehicle dependence and increases transportation options for all users. Modeling VMT for all new capacity expansion projects, including accounting for induced demand, and ensuring a net decrease in annual VMT by investing in VMT offsets will set Maine on the right trajectory to achieve our climate goals. VMT and GHG offsets could include projects to improve public transit, active transportation, electrification, or ride sharing.

**Working Group Recommendation: "Increase transit ridership by improving connections and coordination among transit agencies, investing in new and updated infrastructure, making transit easier to use, and supporting transit-oriented development."**

- **Why is this working group recommendation important?**
  - Transit is a more efficient way to move people and goods than single-occupancy vehicles.[3] Investing in non-vehicle alternatives like public transit will encourage a mode shift away from personal vehicles and toward safer, less polluting alternatives. Establishing goals for increasing transit ridership will encourage investment in proven transit improvements to get more Mainers where they need to go with less carbon intensity.
  - Across Maine, an estimated 50,000 people do not have access to a personal vehicle. People of color are less likely to have access to a personal vehicle and are more likely to be reliant on public transit for commuting and trips to essential services.[4][5] Maine is also demographically one of the oldest states in the nation, and increasingly more Mainers are aging out of the ability to drive safely. Improving public transit access for all users is both a climate and equity imperative.
- **How could this recommendation be improved?**
  - Establishing goals for increasing transit ridership will encourage investment in proven transit improvements to get more Mainers where they need to go with less carbon intensity. We encourage the Climate Council to set targets for increased transit ridership across the state.
  - The current recommendation includes increasing transit ridership generally, but does not commit to specific targets, or to increasing funding for transit, expanding routes, or increasing regularity of existing routes.

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[3] Per person mile, the average transit system emits less than half the CO2 of a personal vehicle, https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/PublicTransportationsRoleInRespondingToClimateChange2010.pdf

4 Pew Research, *Who Relies on Public Transit in the US,* https://www.pewresearch.org/short-reads/2016/04/07/who-relies-on-public-transit-in-the-u-s/

5 Demos, *To Move Is To Thrive: Public Transit and Economic Opportunity for People of Color,* https://www.demos.org/research/move-thrive-public-transit-and-economic-opportunity-people-color

**Working Group Recommendation: "By 2030, expand safe active transportation options by improving active transportation in at least 10 villages and downtowns, paving at least 75 miles of shoulder along highways, principally in rural areas, and developing a pipeline for high priority active transportation trail development that builds at least 10 miles of high priority offroad trails, if supported through special federal funding."**

- **Why is this working group recommendation important?**
  - The specific goals outlined here to improve active transportation in key locations align with the Statewide Active Transportation Plan and reinforce a commitment to a multimodal approach to transportation decarbonization. In addition to reducing greenhouse gas emissions, active transportation comes with a host of health, safety, and economic benefits for Maine communities.
- **How could this recommendation be improved?**
  - Combine this goal with a robust bicycle and e-bike rebate program to create viable transportations options for Maine's marginalized populations.

**Working Group Recommendation: "Launch active transportation partnerships and pilot programs, including a demonstration pilot program to improve safety prior to permanent modifications and e-bike pilot programs for underserved and disadvantaged individuals."**

- **Why is this working group recommendation important?**
  - Electric bicycles make bicycle commuting a viable option for many more people than pedal-only bikes. They are a low-cost alternative to driving, both in terms of up front and maintenance costs, and they have been proven to be an effective strategy for reducing both VMT and GHG.[6]
  - The success of Portland, South Portland, and Freeport e-bike rebates here in Maine demonstrate a proven strategy for getting a new transportation option for low- and moderate-income residents. The success of e-bikes in Maine has been further evidenced by the Maine Department of Transportation and Maine Department of Labor joint program to give people in recovery a reliable, low cost form of transportation to get to jobs, meetings, shopping centers, and other community locations.
- **How could this recommendation be improved?**
  - Committing to dedicated funding with specific goals for a successful e-bike rebate program would ensure the success of the program.
  - We also would encourage exploring adding a rebate for standard bicycles and other mobility alternatives to personal vehicles.

6 Denver's 2022 Ebike Incentive Program Results and Recommendations, https://tinyurl.com/4uh32r72

**Buildings, Infrastructure, and Housing**

We support the recommendations from the Buildings, Infrastructure, and Housing Working Group, most importantly the increased focus on adaptation, resilience, and equity. This shows up most explicitly in Recommendation 4, *Support measures that both reduce carbon and improve resilience*, and is an important theme throughout.

**Working Group Recommendation: Support measures that both reduce carbon and improve resilience**

- **Why is this working group recommendation important?**
    - Many of the strategies to reduce emissions in the built environment – including climate-smart building codes, weatherization, and high-efficiency heating and cooling systems – also have resilience benefits.
    - We strongly support the current recommendation's emphasis on deployment and optimization of community- and building-scale distributed energy resources such as solar and energy storage. In addition to climate benefits, the cost-saving benefits of solar and storage make equitable access to these strategies a high priority.
    - Accordingly, Maine must *leverage education, outreach, and state-run resilience programs to assist Mainers to prepare their homes and businesses to be resilient in the face of climate disasters, focusing on low-income households and Mainers with the fewest resources to prepare*.

**Working Group Recommendation: Establish strong systems and processes to support rapid adoption and compliance with increasingly climate-friendly building codes and standards**

- **Why is this working group recommendation important?**
    - When *Maine Won't Wait* was released in 2020, the state was still operating under the 2009 International Energy Conservation Code (IECC). Following the Climate Council's recommendation to adopt more stringent codes, Maine adopted the 2015 IECC in 2021, and we are optimistic that moving authority for building code adoption and compliance to the new Office of Community Affairs will support more rapid adoption of increasingly climate-friendly building codes and standards. Specifically, it will be important to support contractors and code enforcement officers through training, technical assistance, and contractor licensing, particularly in small and rural communities.
    - We strongly support the current recommendation's call *to adopt new building codes to reach net-zero carbon emissions for new construction in Maine by 2035, and recommend an interim goal of defining a net-zero-emissions stretch code by 2028.*
    - In addition, we strongly support the recommendation to fill the gap in energy efficiency for manufactured homes, which are regulated at the federal level and have represented as much as 20% of Maine's new housing market in recent

years. Maine should leverage voluntary new federal standards that incentivize Zero-Energy-Ready Homes in order to provide Mainers with homeownership opportunities that are affordable and energy efficient.

**Working Group Recommendation: Continue to lead by example in publicly-funded buildings**

- **Why is this working group recommendation important?**
    - Maine has seized the opportunity to lead by example, particularly in state-owned buildings, schools, and affordable housing, and we strongly support the current recommendation to continue this vital work.
    - The Working Group recommendations pertaining to affordable housing are of particular importance:
    - *Set an ambitious target for the number of clean and energy efficient affordable housing units Maine should produce each year, through consultation with community, industry, and government stakeholders.*
    - *Increase the percentage of affordable housing projects that utilize solar energy and battery storage.*
    - *Provide housing developers with robust guidance on accessing state and federal resources to build and renovate affordable, energy-efficient housing for low- and moderate-income Mainers.*
    - *Require energy and cost savings data collection for all affordable housing projects receiving state funds, to help tell the story about the benefits of climate-friendly housing for Maine residents.*

**Working Group Recommendation: Continue the progress on making homes and businesses more energy efficient by investing in weatherization and heating systems**

- **Why is this working group recommendation important?**
    - We strongly support the current recommendation to build on Maine's success in making homes and buildings more energy efficient by investing in weatherization and heating systems by increasing access and participation in energy efficiency programs.
    - We strongly support state emissions standards for heating appliances to complement and provide a backstop to funding, education, and outreach, and urge the Climate Council to endorse that recommendation.
- **How could this recommendation be improved?**
    - The call for expanded retrofit resources and expertise are an integral piece of an equity based plan for the future and we urge the Climate Council to explicitly call for *supplementing existing home repair programs* as part of its commitment to *increasing access and participation in energy efficiency programs for renters, low-income, and rural residents.*
    - The commitment to increasing weatherization and heating systems should also explicitly recognize the resilience and equity benefits of these strategies, which include reducing operating costs and extending passive survivability, and include concrete steps to partner with and identify funding sources for community-based

"energy navigator" programs, potentially though *cross-departmental bundling of currently siloed funds.*

- We recognize the significant greenhouse gas contributions of Maine's industrial sector, and the critical role of this sector to Maine's economy. We therefore emphasize the importance of a thoughtful transition to decarbonized technologies, and strongly support the working group's recommendation to promote emerging energy efficiency technologies in the industrial sector, including new heat pump applications

**Working Group Recommendation: Establish a dedicated funding source and staff to support the new Green Schools Program to reduce energy costs in Maine's 600 existing school buildings through the installation of zero-emissions heating and cooling technologies and renewable energy in new and existing schools.**

- **Why is this working group recommendation important?**
  - As the recommendation outlines, energy is an enormous cost for schools in Maine. Reducing energy consumption by installing zero-emissions heating and cooling systems, tracking the costs and energy savings, and requiring whole-life carbon accounting in the construction of new schools will support the state's decarbonization efforts while supporting the improvement of students' and teachers' built environment. While this is a good start, these recommendations do not go nearly far enough.
- **How could this recommendation be improved?**
  - Following the Maine Climate Council's 2020 recommendation to launch a process to engage key stakeholders including students, older youth, educators, and state leaders in next steps for increased public education offerings related to climate and energy, the Department of Education Climate Education Task Force has developed recommendations to include educational and programmatic aspects to a Green Schools program by:[7]
  - **Developing a Holistic Green Schools Program** that supports schools in developing and executing specific policies and plans to support climate education, healthy communities, and green infrastructure with the help of the Dept of Education and community-based organizations:
    - It is not enough to simply address the infrastructure aspects of schools; international, national and state standards for Green Schools (UNESCO and the US Green Schools Center, among others) include addressing school governance, community engagement, teaching and learning, and facilities and operations;
    - Including students in the process of greening their school environment improves their social, emotional and cognitive development while serving as a green workforce development tool;
    - A tiered state-specific award recognizing the work of schools and students should also be launched in order to celebrate all efforts made

[7] Climate Education Task Force Deliverables, https://docs.google.com/document/d/1z-U7yaOq74WYtKsyfXZv2KFUTDUQhc1M/edit

towards the improvement of schools throughout Maine. This award program along with the aforementioned network will collect and communicate success stories across the state.

- **Increasing Capacity Building for Advancing Climate Literacy in Maine Schools:**
  - Research shows that climate education can help reduce emissions as much as our best technological innovations[8], while also reducing people's vulnerabilities to acute and chronic environmental hazards.[9] If just 16% of secondary school (equivalent to middle and high school) students around the world in middle and high income countries studied climate change, it would result in cutting almost 19 gigatons of CO2 by 2050;
  - Teachers and school staff need significant support in order to include interdisciplinary climate education in their curricula. Funding for staffing, professional development and transportation that support the educational and programmatic aspects of Green Schools is critical to the success of such an initiative.

**Coastal and Marine**

We support the recommendations of the Coastal and Marine working group and applaud the Co-Chairs and members for emerging with a strong, clear set of priorities informed by Maine's working waterfront. This last winter, 60 percent of Maine's coastal infrastructure was damaged or destroyed by climate-linked storms, underscoring the urgency with which resilience and adaptation measures must be taken. The Gulf of Maine is the backbone of Maine's economic, cultural, and ecological systems, and it is necessarily a focal point of this Climate Action Plan.

**Working Group Recommendation: "Increase resilience of public and private working waterfront infrastructure to climate change."**

- **Why is this working group recommendation important?**
  - Last winter's storms confirm a trend that participants in Maine's working waterfront have been seeing for years. Maine's coastline is vulnerable to sea level rise and storm surge, and rebuilding to current standard is simply not enough to keep fisheries and other coastal industries productive. It is imperative that we are proactive in improving the resilience of our working waterfronts now to prevent further damage, and this will take significant planning and investment.

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[8] PLOS ONE, *The role of climate change education on individual lifetime carbon emissions,* https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0206266

[9] nature, *The effect of education on determinants of climate change risks,* https://www.nature.com/articles/s41893-020-0512-y

**Working Group Recommendation: "Enhance ongoing monitoring and data collection that provide baseline data to guide informed decision making and create new monitoring programs to fill data gaps."**

- **Why is this working group recommendation important?**
    - We know the Gulf of Maine is changing rapidly, but we cannot respond to that change effectively without adequate monitoring and data collection. Tracking the impacts of climate change in real time enables solutions to be implemented in a more targeted and cost effective manner. This includes creating and funding a statewide framework, coordinating hub, and associated technical capacity to support essential monitoring and data collection.

**Working Group Recommendation: "Promote stewardship of climate resilient ecosystems to take advantage of diverse markets and grow existing opportunities."**

- **Why is this working group recommendation important?**
    - Mainers have a strong history of effectively stewarding the resources contained within the Gulf of Maine. To do so effectively today, stewardship must be conducted through a climate lens. This includes supporting emerging economies as the Gulf of Maine changes, and managing and adapting Maine's fisheries and aquaculture in accordance with those changes.

**<u>Community Resilience</u>**

Despite progress on our climate goals over the past four years, Maine has experienced increasing climate impacts including sea level rise, increased precipitation, increased storm intensity, shortened winters, and widespread infrastructure damage. Climate change is now a reality for Maine, and it is essential that we work to adapt to change while simultaneously mitigating future impacts. The Community Resilience Working Group recognizes that climate change disproportionately impacts marginalized and vulnerable communities, and so puts forward recommendations with equity and authentic community engagement as core guiding principles. Further, mental health resilience is a critical feature of Maine's climate response. The below recommendations are particularly important for inclusion in the final Climate Action Plan.

**Strategy F, Recommendation 1- Empower local and regional community resilience efforts**

- **Why is this working group recommendation important?**
    - There are no one-size-fits-all solutions to climate change. Maine is a large state that has historically valued home rule and empowers communities to make their own decisions about collective wellbeing. The Community Resilience Partnership has already proven to be one of the most successful programs to emerge from *Maine Won't Wait,* and this is largely due to the level of agency local communities have over their chosen mitigation and adaptation strategies. Local and regional

resilience efforts are effective and responsive to community needs as long as they are adequately resourced.

**Strategy F, Recommendation 4- Explore options for "getting out of harm's way"**

- **Why is this working group recommendation important?**
    - We know that climate change is upon us, and it is critical that we support Maine residents and businesses in getting out of harm's way as climate change continues to impact our infrastructure. This is the first time Maine has seriously discussed getting out of harm's way as an important climate strategy, which would include conducting a feasibility study to explore a voluntary, state-level buyout and acquisition program, including potential funding mechanisms, administrative and institutional structures, and the social, ecological, economic, cultural implications of implementing such a program.

**Strategy G, Recommendation 4- Develop a comprehensive, long-term funding plan and investment strategy to support the implementation of *Maine Won't Wait*.**

- **Why is this working group recommendation important?**
    - All of the tools and interventions to respond to climate change require funding. The recommendations contained within this Climate Action Plan are a helpful guide, but they need funding to be implemented. A coherent and robust funding strategy to support this Climate Action Plan will make each of the recommendations more powerful and would ensure their effective implementation.

**Strategy H, Recommendation 1- Create a Climate Psychology Task Force to provide resources for climate leaders, service providers, public officials, activists and others involved in climate work on best practices for addressing mental health, psychological resilience, climate communications and engagement**

- **Why is this working group recommendation important?**
    - Climate change is inducing a new wave of psychological distress that is particularly prominent amongst youth and people whose livelihoods have been directly impacted by climate change, including those who have little control over their working conditions, such as farmers and fishermen. Depression and anxiety associated with climate change is a real public health crisis and should be treated as such. Establishing a Climate Psychology Task Force and resourcing it adequately will help to better understand the scope of the problem and channel resources to those who can administer mental health support for all people in Maine.

**Energy**

We support the recommendations from the Energy Working Group, and offer the below as a subset of the full recommendations that represent priorities from the environmental community for inclusion in the final climate action plan.

**Working Group Recommendation: Decrease energy burdens for Mainers by reducing barriers to participating in the state's energy transformation.**

- **Why is this working group recommendation important?**
  - It is imperative that we better understand energy burden across all energy costs to ensure that the clean energy transition is equitable and benefits all Mainers. The following components of the Energy Working Group's recommendations will be critical to this aim.
    - Conduct a comprehensive assessment of residential energy burden in Maine by 2025 that considers all types of energy expenditures in its analysis, including those associated with electrification of buildings and transportation.
    - Reassess energy budgets of highest burdened populations every three years to build understanding of energy disparities and inform targeted policy interventions that maximize benefits for low- and moderate-income households.
    - Set a target for reducing energy burden of low- and moderate-income households based on an updated, comprehensive analysis of energy-related costs.
    - Reduce capital and financing barriers: Develop and support the availability of expanded financing and ownership models to reduce barriers to accessing the benefits of clean energy and energy efficiency investments for low- and moderate-income households, including renters, disadvantaged communities, and small businesses.

**Working Group Recommendation: Advance policies that support timely and cost-effective planning and buildout of necessary clean energy infrastructure to meet state goals and statutory requirements including 100% clean electricity by 2040.**

- **Why is this working group recommendation important?**
  - Achieving 100% clean electricity by 2040 will require rapid clean energy infrastructure deployment, including generation and transmission. This must be done in a planned manner to ensure alignment with other environmental priorities regarding land use best practices. To do that, the Energy Working Group agrees we need to:
    - Establish a regular cadence of clean energy procurements to occur at least every two years to ensure timely deployment of projects.
    - Coordinate and inform procurements with grid planning activities.
    - Annually evaluate outcomes, technologies, and electricity market opportunities, and implement changes as needed to ensure success.

- Develop stakeholder-informed resources that provide fact- based information, model ordinance or zoning language, and community benefit information to assist Maine communities in supporting the development of clean energy in a manner that meets local needs.
- Review and evaluate state policies for the permitting, siting and procurement of clean energy projects and transmission resources, with the intent of finding opportunities to enhance efficiency, predictability, and transparency, while providing for meaningful public engagement and protection of natural resources.
- Continue to improve and modernize the process for connecting clean energy projects to the grid to support certainty, timeliness, affordability, and improved utilization of resources on the grid.
- Implement the Maine Offshore Wind Roadmap, including near- term infrastructure investments—such as a dedicated Maine port—transmission and interconnection planning, the Gulf of Maine Research Array, and advancement of Maine-based innovations to meet the state's energy goals and to position the state as a competitor and beneficiary in the emerging national and international offshore wind industry.
- The Governor's Energy Office (GEO) and the Public Utilities Commission (PUC) should continue to engage in and seek opportunities for regional policy coordination and cost-sharing of large-scale resource procurements and transmission infrastructure.

**Working Group Recommendation: Develop and implement demand management and innovative load flexibility strategies and technologies to support energy reliability and resiliency, reduce electricity peaks and overall system costs, accelerate beneficial electrification, and reduce emissions.** ***Note: these recommendations incorporate input from both the buildings and transportation working groups as well.***

- **Why is this working group recommendation important?**
  - In addition to expanding clean energy infrastructure, we also must ensure we are utilizing available technological and rate-based tools to increase the efficiency and reliability of our electric system. To do so, we must:
    - Adopt software and technologies that enable signals based on electricity grid conditions to manage demand and supply.
    - Facilitate customer participation in [and equitable access to] demand management programs through the adoption of supportive policies, programs, markets, and regulatory mechanisms.

**Natural and Working Lands**

We generally support the Natural & Working Lands Group's updated recommendations, especially securing permanent funding for Land for Maine's Future – our state's most successful land conservation program. We enthusiastically endorse efforts that will help intentionally focus a coordinated strategy to conserve high biodiversity areas, such as a targeted expansion of ecological reserves. In order to holistically achieve Strategy E of our state's climate plan, we must plan diligently for the long term – looking well beyond the 2030 goals – all of which will undoubtedly require additional capacity.

Furthermore, we adamantly support the call for government-to-government discussions between the State of Maine and the Tribal Nations of the Wabanaki Confederacy as a necessary platform to inform the role, relevance, and contributions of Tribal lands towards conserving 30% of our land area by 2030 and other State goals. For decades, the conservation of land for environmental protection has often failed to prioritize tribal voices and needs, and in many cases throughout history, has actively excluded tribal leaders and citizens from participation or access. Despite these injustices, the Wabanaki Nations maintain spiritual, cultural, and physical connections with these lands and deserve to be able to determine their communities' futures.

Facilitators and leaders of the Natural and Working Lands Working Group embraced opportunities to solicit input from various sub-working groups, which included stakeholders and individuals outside of the group's official members. However, we still expect the Maine Climate Council to review and strengthen the recommendations through an equity lens. In that light, we seek to improve the recommendations primarily detailed in *Recommendations 1* and *4* with the following suggestions:

**Recommendation 1: Highlighting exceptional resources, seizing opportunities for regional collaboration, and planning beyond 2030.**

- **Why is this working group recommendation important?**
    - In the original 2020 plan, two of the three initial recommendations from the Natural and Working Lands Working Group only extend to 2030. This Climate Action Plan should embrace a vision for our long-term goals, beyond 2030 and beyond 30% land conservation as the sheer size of Maine's land-base, combined with the state's rich ecology, vibrant communities, and commitment to building a resilient future, all lead to a growing number of demands on our landscape. We know our state needs more housing for our neighbors, complex and diverse forests, economic engines in rural communities, renewable energy developments, a food system that can withstand fragile supply chains, and more. These competing needs are best considered together versus in isolation. In tandem with assessments of our transportation, energy, and community development needs, developing a strong and comprehensive landscape conservation blueprint that outlines the most important places for habitat,

biodiversity, and ecological resilience, would serve as a valuable tool toward the prudent and targeted deployment of resources. The Climate Council's "Intersecting Issues" discussions, combined with direction from State's new Office of Community Affairs, provide robust catalysts toward advancing our current and long-term conservation goals.

- **How could this recommendation be improved?**
    - Old growth (older than 170-year old) forests support the largest carbon pools of all Northeast forest types while concurrently supporting the highest biodiversity, but comprise less than 1% of the state's forests. According to the Scientific and Technical Subcommittee of the Maine Climate Council's 2024 Update: *"Severe disturbances (such as clearcutting or infestation by invasive insects) have the potential to convert forests from carbon sinks to sources at least temporarily depending on the severity and frequency of the disturbance"* (p. 17). Given both the scarcity and exceptional nature of this forest type as the best for sequestering carbon, we advocate for including "old growth forests" within the areas listed within the topline statement characterizing *Recommendation 1.*
    - Planning past 2030 will require inter-agency cooperation where innovation and collaboration are core tenets in the work to balance the needs of both our state's human and wildlife communities in the face of climate change. In addition to the development of Maine's first landscape conservation blueprint, we urge for 1) more comprehensive review of areas such as the Land Use Planning Commission's (LUPC) function and form in order to to modernize conservation policies and practices for the unorganized territories and 2) the formal adoption of forward-looking and regionally-collaborative initiatives such as those proposed by the New England-based Wildlands, Woodlands, Farmlands, & Communities Vision for Land Protection.[10]

**<u>Recommendation 4</u>: Emphasizing that added capacity and soliciting diverse expertise are critical components to achieving our shared conservation and climate goals.**

- **Why is this working group recommendation important?**
    - We strongly agree with *Recommendation 4*, which highlights capacity issues and opportunities. These timely efforts will take resources to accomplish – chief among them: adequate natural resource agency staffing. It is our understanding that nearly all of the agencies tasked with carrying out this important work are understaffed and underpaid. It is imperative that we compensate current employees fairly and work to retain those employees. Additionally, our state agencies are unable to fill key positions due to non-competitive salary levels. Position vacancies are hindering our natural resource agencies' ability to do their best work protecting and restoring Maine's natural resources detailed within our state's Climate Action Plan. We should not expect them to complete this essential work without adequate support. If we are to reach our collective goal to

[10] Wildlands, Woodlands, Farmlands and Communities Dashboard, https://wildlandsandwoodlands.org/progress/dashboard/

increase the total acreage of conserved lands in the state to 30% by 2030, Maine's natural resources agencies should have staff and resources to adequately support existing and novel conservation endeavors.

- **How could this recommendation be improved?**
    - In order to help ensure that staff at our natural resource agencies are adequately supported and encouraged to consider the intersectional interests and steps needed to achieve our conservation goals, we recommend convening a diverse group of stakeholders to periodically review the state of our forests; help develop public policies and management strategies that focus on protecting and enhancing biodiversity and forest carbon sequestration; and provide input into the decadal update to the State Forest Action Plan.
    - Bringing together people with different expertise and points of view to tackle complicated issues is a time-honored strategy – and exactly the one that Gov. Mills, Governor's Office of Policy Innovation and the Future's (GOPIF) Director Pingree, and the Maine Climate Council employed in order to help our state develop and implement strategies to address climate change in Maine. The current and future health of Maine's forests is of tremendous interest to all of us. Yet many complex dynamics threaten the forest: invasive insects and disease; drought and increased risk of forest fires; development and conversion pressures; changing markets for wood, a shorter harvest season, and multiple pressures that make logging and timber harvest – the foundation of the forest products industry – more precarious than ever before.
    - Establishing a diverse group of stakeholders to take on this essential work is one of many important steps that could help Maine keep our forests as forests, mitigate and adapt to climate change, ensure a future home for both rare and common species, and protect and enhance overall biodiversity – all while supporting a thriving forest-based economy. The woods of Maine are an incredibly unique and valuable resource, comprising the bulk of the largest intact temperate forest block in North America and having nourished and supported communities, both human and natural, for thousands of years. Additionally, at least 15 other states have similar advisory entities, including neighboring New Hampshire.
    - We have a responsibility to the wildlife, communities, and businesses, in Maine and beyond, to think critically about policies that keep our forests healthy, intact, and productive by using the best available science and convening a broad range of voices and expertise in setting stewardship and management policy and supporting natural resource agency staff in their work to help our State achieve our climate and conservation goals. To implement the recommendations (with or without our improvements), it is clear that the State needs more people and resources to plan for the future. We hope the State continues to seek as much federal funding as possible to support this work and plans ahead for all Mainers.

**Materials Management Task Force**

We are pleased that the Maine Climate Council established a task force to address materials management in the 2024 climate action plan. The connections between waste and climate issues are clear to many who work in this space and we look forward to working together with the Climate Council to address key challenges to reducing GHG emissions in the materials management sector. We hope that the establishment of this task force reinforces the need for inclusion of materials management in future climate action planning for Maine, and opens up the possibility of an official Materials Management Working Group in the future.

One common theme amongst the recommendations within the Materials Management Task Force, and across all the key working groups of the Climate Council, was a clear need for investments in state and regional capacity. Communities need reliable sources of information and increased technical assistance to accomplish these goals, and investments are necessary at all levels to achieve this.

**Recommendation C. Track and Measure Emissions Reductions via Maine's Consumption-Based Emissions Inventory**

- **Why is this task force recommendation important?**
    - These recommendations are imperative, and we need to quantify and internalize these types of emissions that we commonly externalize onto other places. Maine's consumption behavior impacts GHG emissions all over the world. Reduction of consumption-based emissions as the overarching goal will help advance reuse targets, emphasize need for repair, and give us a more complete picture of the climate impacts of generating waste.

**Recommendation D. Invest in Maine's Circular Workforce**

- **Why is this task force recommendation important?**
    - Investment in Maine's circular economy and workforce can create jobs and economic benefits while reducing waste and emissions. Reuse creates 200 times more jobs as landfills and incinerators, and "train the trainer" programs, business incubators, and community college and technical school programs can grow the field of reuse.

**Recommendation F. Foster Resilience in the Built Environment through Materials Collection and Reuse**

- **Why is this task force recommendation important?**
    - As Maine's infrastructure is tested by increasing storm intensity and flooding caused by climate change, it is imperative that deconstruction, salvaging, and reuse are considered in the building process. Any new projects should have a

deconstruction plan that centers reuse, and barriers to accessing salvaged materials from demolition and storm debris should be removed (alongside safety considerations) to ensure that materials can be reused for future projects.

**Recommendation G. Reduce and Capture Methane Emissions from Maine's Waste Sector**

- **Why is this task force recommendation important?**
    - While it is important that we ensure large landfills and waste processing facilities are capturing emissions and preventing methane release, we cannot do so in a way that incentivizes incineration or landfilling of materials as a renewable energy resource.
- **How could this recommendation be improved?**
    - G.2. should be strengthened with language to explicitly remove the use of REC credits that incentivize waste to energy (WTE) and landfill gas to energy (LGTE) as renewable sources of energy. We should require investments from large landfills and waste processing facilities to capture emissions and prevent the release of methane and GHGs and provide financial assistance to municipal and state projects that improve capture, but allowing the incineration or landfilling of resources to qualify for renewable energy credits and compete for investments in solar, wind, and other truly renewable energy sources should be highly discouraged.

**Recommendation A. Advance Policies and Deploy Funding to Reduce Emissions Across Product Life Cycles by Growing Maine's Circular Economy**

- **Why is this task force recommendation important?**
    - Within this recommendation, we fully support the implementation of residential Save Money and Reduce Trash (SMART) or Pay-As-You-Throw (PAYT) programs in conjunction with advancing cost-saving disposal alternatives such as composting, recycling, and reuse. These programs create a more equitable means of managing waste, and encourages households to divert their waste before considering disposal.
- **How could this recommendation be improved?**
    - In earlier discussions within the Materials Management Task Force, there was mention of establishing a dedicated task force to study the climate and emission reduction potential of specific policies related to materials management, but this has since been removed from the overall recommendations. The establishment of a designated task force would be a concrete step to advance policies related to sustainable materials management, and we recommend that the Climate Council consider recommending a dedicated task force. We would also suggest that the Climate Council recommends a statewide "skip-the-stuff" policy to transition to disposables only upon request, and supports policies for reuse

requirements for on-site dining to prevent the use of unnecessary single-use products. As emphasized in the introduction of these recommendations from the Materials Management Task Force, preventing and avoiding the creation of waste addresses emissions reductions all along the supply chain in addition to reducing emissions at the point of disposal.

**Recommendation B. Prevent Food Loss and Waste to Reduce Food Waste by 50% by 2030 (base year 2016) for Maximum Emissions Reduction (Local and Global). Prevention is the best strategy for climate impact.**

- **Why is this task force recommendation important?**
    - This is a strong, effective recommendation that has clear benefits for Maine's people, farmlands, business sector, and our shared environment. We fully support these efforts to reduce wasted food and adopt strategies that put edible food into the hands of Maine people and keep it out of landfills and incinerators.
- **How could this recommendation be improved?**
    - One missing component within this recommendation is the need to address the use of single-use plastics as a misguided solution to prevent wasted food and food spoilage. We suggest that explicit language be added to provide stronger best practices that allow consumers to purchase loose produce and dry goods in desired quantities as a means of preventing overconsumption rather than pre-packaged and plastic-wrapped perishable goods, a practice which frequently results in wasted and spoiled food at both the retail and residential level.

**Recommendation E. Regionalize and Scale Up Access to Waste Prevention and Diversion Services (reduce transport miles).**

- **Why is this task force recommendation important?**
    - The inclusion of funding for additional staff capacity in addition to increased coordination at the state level is essential in supporting this recommendation, and we appreciate that these are key components of the recommendation.
- **How could this recommendation be improved?**
    - To further support this recommendation and reinforce this critical need for technical assistance in materials management issues, we recommend that materials management be incorporated into the newly established Office of Community Development to provide a secure avenue for municipalities, regional planning offices, and similar entities to receive this critical support.

**<u>Land Use Cross Cutting</u>**

This year, a new intersectional group was assembled to discuss land use best practices during the time of climate change. Members from all working groups came together to identify how to build out clean energy infrastructure and respond to the impacts of climate change while

maintaining Maine's character and protecting the natural and built spaces that make this place special. This is no small task, but identifying land use planning as a critical piece of the climate conversation was a big positive step forward this year. In particular, one recommendation rose to the top that encompasses an overarching principle that should guide our climate response moving forward:

**Promote smart growth and compact development.**

- **Why is this discussion group recommendation important?**
    - Maine is growing, and as we grow, we must do so in a way that ensures safe and affordable housing and transportation services for all while minimizing our impact on the land and the climate. We can do that by planning our communities in such a way that prioritizes compact development, promotes clean energy and electric grid investments in places that already have utility infrastructure, encourages transit-oriented development and safe biking and walking, and protects our natural and working lands. We encourage the Climate Council to prioritize smart growth through dense development, coordinated community planning, climate-aligned zoning, and sensible siting of key community resources.

**A Note on Equity**

The recommendations from the Equity Subcommittee's 2023 report to the Maine Climate Council were a valuable tool for each Working Group to integrate into their work as they drafted these recommendations. Additionally, the work of the Mitchell Center with priority populations over the course of the drafting process provided valuable insights for incorporation into the 2024 Climate Action Plan, and we look forward to their presentation at the upcoming Maine Climate Council meeting in September.

However, similar to the *Maine Won't Wait* drafting process, the engagement with priority populations was misaligned with the timing of the drafting process, and the results of the community surveys came in too late to be fully considered and integrated by respective working groups.

Our hope moving forward is that outreach and engagement surrounding the Climate Action Plan becomes systematized to ensure consistent engagement with priority populations over time rather than just discrete feedback opportunities when the Climate Action Plan is being drafted. Community liaisons from each of the identified priority communities should be compensated for their continued contributions to community-led implementation and feedback. Establishing such liaisons and compensating them for their time would mitigate extractive interactions with priority populations and build relationships with the Climate Action Plan that would increase the plan's relevance and tangibility for all Mainers.

Additionally, we hope to see progress tracked over time with concrete metrics that measure the efficacy of the Climate Action Plan in facilitating an equitable response to climate change.

Alliance of
Maine Health
Professionals
for Climate Action

October 22, 2024

Maine Climate Council
Governor's Office of Policy Innovation and the Future
181 State House Station
Augusta, Maine 04330
Via email: maineclimatecouncil@maine.gov

Dear Members of the Maine Climate Council,

On behalf of the Alliance of Maine Health Professionals for Climate Action, we would like to take this opportunity to thank you, as well as the many others who participated in the development of the *Maine Won't Wait* draft report. We know and appreciate the process to develop this plan was challenging and required significant time and resources.

As health professionals we are keenly aware of the seriousness of the climate crisis here in Maine and across the globe. We see the impacts on our patients and the communities we care for. We understand that climate change affects everyone's health, and we are particularly concerned about individuals and communities who are most vulnerable, including seniors, children, and those marginalized by low wealth, race, disability, etc., who often are less resilient because of lack of resources and decreased capacity to manage the impacts of climate change.

Our lens is health, and we believe that climate solutions are health solutions.

As the climate council works to finalize the plan, we would like to offer the following comments and recommendations:

1. **Highlight Indoor Air Pollutants.** Buildings are more than just shelters; they directly influence the health of the people within them. In Maine, residential and commercial buildings can pose significant health risks due to poor indoor air quality from fossil fuel-burning appliances, inefficient heating and cooling systems, and inadequate ventilation. Fossil fuel-based systems emit pollutants like carbon monoxide, nitrogen dioxide, and particulate matter (PM2.5), all of which can worsen conditions such as asthma, chronic obstructive pulmonary disease (COPD), and cardiovascular disease. Vulnerable populations, particularly children and older adults, are at higher risk of health complications due to poor indoor air quality.

   We urge the Council to prioritize replacing fossil fuel-powered appliances in buildings frequented by children, youth, the elderly, and individuals with health conditions like asthma and heart disease. Electrifying heating and cooling systems in daycares, schools, hospitals, community centers, and health clinics not only reduces emissions creating healthier indoor environments, but these buildings can also serve as models for clean energy solutions, fostering education around the health and climate benefits of electrification.

2. **Invest in training diverse health professionals across the state** to deliver outreach and education during clinical interactions and as speakers at community events. Health professionals are trusted voices in their communities and they

engage with Maine residents every day, making it a crucial platform for effective communication. Given that climate change affects the health of all residents in Maine, messages from health professionals could have a significant educational impact.

3. **Focus on mitigation strategies.** While adapting to climate change and building resilience are essential, we must also prioritize efforts to reduce or mitigate greenhouse gas emissions. This includes incentivizing the use of renewable energy by creating even more pathways for homes and businesses to switch appliances from those that burn fossil fuels like coal, oil, and gas, to those that use cleaner energy, like electricity. In addition to focusing on demand-side policies, we must address fossil fuel infrastructure on the supply side as well. A comprehensive approach will ensure a more sustainable and healthier future for all Mainers.

It is our strong belief that ending climate pollution is a new beginning for health. We also believe the only way to reverse the climate crisis is to end the use of fossil fuels. To that end, we support all policies and activities that will help achieve that goal.

With that, please accept these comments and know that we are here to help.

Sincerely,

Daniel Oppenheim, PhD, MD, Chair
Kathy Bourgoin, MD, Vice-Chair
Alliance of Maine Health Professionals for Climate Action

*The Alliance of Maine Health Professionals for Climate Action (The Alliance), begun in 2024, is made up of health professionals including (but not limited to) nurses, nurse practitioners, physician assistants, physicians, students, and public health practitioners concerned about the impacts of climate change on all those who live, work, and visit Maine. The Alliance is a state affiliate of the national Medical Consortium on Climate and Health and is supported by Physicians for Social Responsibility, Maine Chapter.*

**From:** noreply@informe.org on behalf of Office of Policy Innovation & Future
**To:** Siegel, Amalia; Maine Climate Council
**Subject:** Webform submission from: Contact the Maine Climate Council
**Date:** Friday, October 18, 2024 8:22:29 AM



Submitted on Fri, 10/18/2024 - 08:22

Submitted by: Anonymous

Submitted values are:

**My comments are about:**
Strategy D - Create Jobs & Grow Maine's Economy Through Climate Action

**First name**
Jeff

**Last name**
Marks

**Email**
jeff@climateworkmaine.org

**Town/City**
Portland

**Affiliation/Company**
ClimateWork Maine

**Job title**
Executive Director

**Message**
Thank you for inviting additional feedback on the revised climate plan, Maine Won't Wait.

My name is Jeff Marks and I am Executive Director of ClimateWork Maine, a support network of businesses created to help businesses take action on climate change, meet its challenges and seize the opportunities it presents to build a more sustainable economy for the future. Our purpose is to provide services and networking to educate, connect, champion, and promote Maine companies with products, services, or projects related to climate solutions; support and assist companies that want to do more on climate change and related work; and help address conflicts at the intersection of climate, energy, and the economy. In other words, our mission to is help companies grow and succeed in a carbon-constrained economy.

As a business organization focused on climate action, we recommend that reference be made

to ClimateWork Maine as a resource to implement Strategy D - Create Jobs & Grow Maine's Economy Through Climate Action.

ClimateWork Maine (CWM) is a new Statewide business support service system for businesses of all sectors, sizes, and locations. We engage businesses, workers, and communities; strengthen partnerships with Maine's private, public, and nonprofit sectors; and support the growth and deployment of climate solutions in operations, products, services, projects, and with economic and workforce development strategies.

As mentioned, CWM is an action-oriented organization dedicated to harnessing the tremendous influence of the business community for a carbon-free future. We bridge the gap between the environmental community's quest for ambitious climate and clean energy solutions and strategies and the business community's growing role in moving the climate agenda forward and confronting the climate crisis.

Maine has a robust constituency supporting environmental and energy issues, strong backing for new innovative technologies, and an enabling professional support services and nonprofit community. However, access to capital and investment can be problematic, and geographic distances and access to out-of-state resources are a challenge. Maine is a small-business state which could benefit from a production, manufacturing, and service sector with better access to financial, intellectual, and technical support and investment. Companies are often not aware of all the resources available to them and individually lack the ability to scale up to meet market needs. Coordinated collaboration with partners, active networks, and helpful information and access to resources can help Maine businesses attract visibility, investment and demand for their technologies and services.

CWM is intended to shelter, support, and advance businesses in a climate-change-constrained economy, whether they are looking to manufacture clean energy products and technologies, contribute to modern buildings and transportation systems, seek beneficial use and stewardship of our natural resources, or invest in resilient energy infrastructure strategies. Our work will lead to significantly lower greenhouse gas levels, and importantly, a diversity of opportunities for a diversity of Maine businesses. In short, we will help them navigate and access new and existing resources they need to grow and succeed.

CWM works with companies that can provide jobs for hundreds of Maine's engineers, installers, fishermen, foresters, service and utility workers, and small and large business owners and their employees. Engaging small businesses and startups especially will help them grow their businesses and workforce, market their products and services, and contribute to climate solutions.

Please consider including ClimateWork Maine as a primary resource of businesses, by businesses, for businesses to implement Strategy D: Create Jobs and Grow Maine's Economy Through Climate Action.

Thank you!

| | |
|---|---|
| **From:** | Esther Mechler |
| **To:** | Maine Climate Council |
| **Subject:** | Food and sustainability, greenhouse gas emission and preventing worse climate impact |
| **Date:** | Thursday, September 19, 2024 10:24:05 AM |
| **Attachments:** | Copy of Environmentally Sustainable Diet Fact Sheet.pdf |



Here is a PDF outlining how eating plant-based, moving in that direction as a state, will bring us closer to our mission. This is something everyone can work on at home.

We have not yet seen evidence of the advantage of doing this yet in what has been published!!

Please let us know if this is accepted and will be part of the public input. I can provide print copies of this for tabling.

Thank you Molly!

**Esther Mechler**
**207-798-7955**
"I love forms beyond my own and regret the borders between us" Loren Eiseley

FACT SHEET

# An Environmentally Sustainable Diet

# Eating for the Future

PhysiciansCommittee
for Responsible Medicine

The food we consume has a major impact on the environment and the health of our planet. Animal agriculture is one of the largest contributors to greenhouse gas emissions as well as land and water use. Consuming a plant-based diet is one of the best things you can do for your own health, and it is one of the easiest ways you can reduce your environmental impact on the planet, by making an actionable change every single day.

## The Global Impact of Our Diet on the Environment

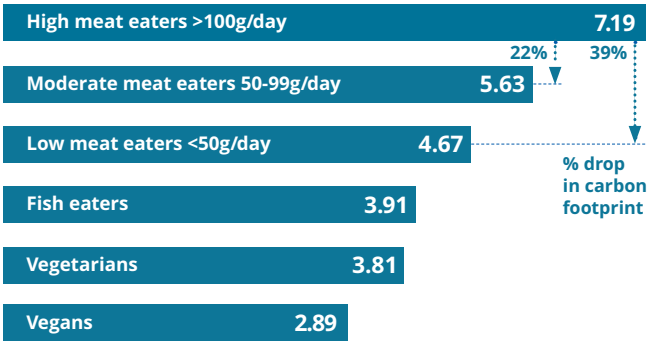
The global food system is responsible for:[1]

- 34% of total global greenhouse gas emissions.
- 70% of the world's freshwater use.
- 78% of the world's freshwater pollution.
- 75% of the world's ice-free land being used by humans, primarily for agriculture.
- Damaged ecosystems and a loss of biodiversity.

## Greenhouse Gas Emissions

Greenhouse gases trap heat in the Earth's atmosphere, contributing to global warming. Common greenhouse gases include carbon dioxide ($CO_2$), methane ($CH_4$), and nitrous oxide ($N_2O$). Cattle, used to produce beef and dairy, are a major source of methane, which is released as eructation and flatulence, and is one of the more potent greenhouse gases. An analysis published in 2023 looked at the diets of more than 55,000 people included in the EPIC-Oxford study and found that compared with a diet containing more than 100 grams of meat per day, a vegan diet resulted in 75% less total greenhouse gas emissions.[1]

**Figure 1: Daily Carbon Dioxide Emissions According to Diet Type (For a 2,000 kcal per day diet) [1]**




## Land Use

Fifty percent of the habitable land on Earth is devoted to agriculture, and of that land animal agriculture encompasses 77%, while crops encompass only 23%.[2] The production of animal protein is particularly inefficient. Most of the crops grown are used to feed animals who are slaughtered for food, amounting to 67% of crops grown globally.[3] The EPIC-Oxford study found that a vegan diet resulted in 75% less land use compared with an animal-based diet.[1] For American adults following the standard omnivorous diet, approximately 50% of the land used to produce their food is attributable to red meat alone.[4] Cows, for example, require large amounts of land to sustain them, both in terms of physical space, but also in terms of the land required to produce the tons of crops they will consume.

## Water Use

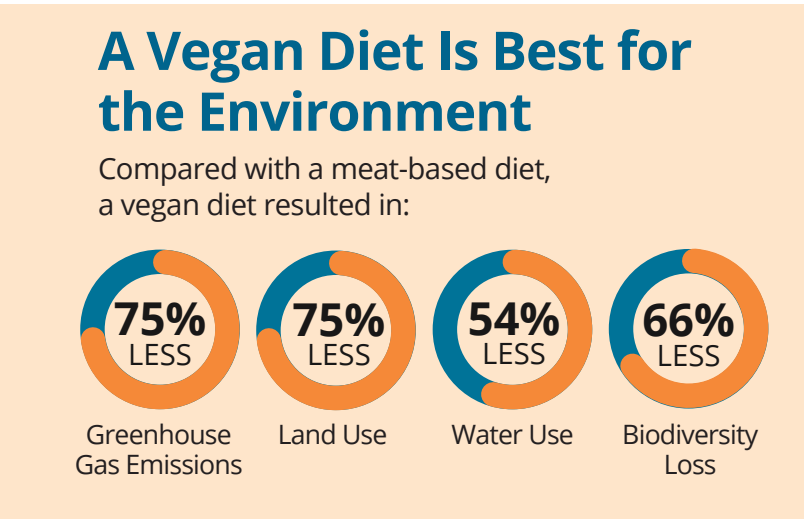
A vegan diet results in more than 50% less water use compared with an omnivorous diet.[1] Meat and meat products require the most water, at around 475 liters per 100 grams of meat produced. Fruit and vegetables require significantly less water to grow, equating to approximately 80 and 15 liters per 100 grams, respectively.[5] Livestock farming requires large amounts of water for feed crop production, drinking water, and processing during slaughter and packaging.

## Biodiversity Loss

Adopting a plant-based diet can also help to preserve natural habitats. Animal agriculture is one of the leading drivers of deforestation, particularly in the Amazon, and habitat destruction, as vast areas of land need to be cleared to make way for grazing livestock and growing feed crops. The destruction of these natural habitats threatens numerous plant and animal species, resulting in a loss of biodiversity. A vegan diet results in more than 65% less biodiversity loss compared with an omnivorous diet.[1]

According to a Greenpeace report titled "Slaughtering the Amazon," cattle farms occupy around 80% of deforested land in the Amazon, and every 18 seconds, one additional hectare of the Amazon rainforest is lost to cattle ranchers.[6] Research published in 2023 found that if the world switched half of their meat and dairy products to plant-based alternatives, we could potentially end deforestation. Additionally, greenhouse gas emissions would decline by 31% by the year 2050.[7]

**Figure 2: A Vegan Diet Reduces Environmental Impact.**




## Small Amounts of Animal Products Make a Big Difference

Research published in 2023 compared a vegan diet, containing no animal products, with a Mediterranean diet that included just more than 10% of daily calories from meat and dairy.[2] When calories were matched, a vegan diet came out on top with a 44% lower total environmental impact. And another analysis of people living in the United Kingdom found that as people removed meat, fish, dairy, and eggs from their diet, the environmental impact of their diet was reduced across all metrics.[1]

## The Impact of Plant-Based Meat Alternatives

People who don't consume meat may turn to plant-based meat alternatives, or "mock meats," such as vegan burger patties or vegan "chicken" strips. These products commonly have a base of soy, wheat, mushroom, or pea protein. Animal protein has greater greenhouse gas emissions than plant-based meat alternatives; farmed fish results in 34% greater greenhouse gas emissions, poultry in 43%, pork in 63%, and beef in 93%.[8] Plant proteins from less-processed sources, including tofu, pulses, and peas, have even lower greenhouse gas emissions.[9]

## Cell-Cultured Meat: One Possible Solution

Cultured meat (also called cultivated meat, lab grown meat, or *in vitro* meat) is a form of cellular agriculture, in which meat is grown from cells in a lab. Though the technology is still evolving, a single biopsy from one animal could ideally yield tens of thousands of pounds of meat, as opposed to rearing and slaughtering thousands of animals. The intensive animal agriculture farming practices required to meet the large-scale demand for animal products pose several concerns surrounding not only environmental resources, but also animal welfare. Cultured meat may offer a sustainable alternative for those wanting to more ethically consume meat while simultaneously reducing their environmental impact.[10]

One of the greatest benefits of cultured meat over conventional meat is that it potentially has a significantly lower environmental impact. Compared with conventional meat, cultured meat products may result in up to 96% less greenhouse gas emissions, 99% less land use, 96% less water consumption, and 45% less energy use.[11] According to a 2021 report by the Good Food Institute, if sustainable energy is used in the production of cultured meat, it becomes competitive with pork and chicken, which have substantially lower environmental impacts than cattle.[12]

## Conclusion

Opting for a whole food, plant-based diet is a simple daily action that can mitigate your environmental impact. The environmental effects of intensive farming practices are a result of the demand we place on animal agriculture through our food choices. Together, we can make the sustainable choice, one plate at a time.

### References:


1. Scarborough P, Clark M, Cobiac L, et al. Vegans, vegetarians, fish-eaters and meat-eaters in the UK show discrepant environmental impacts. *Nat Food*. 2023;4:565–574. doi:10.1038/s43016-023-00795-w
2. Filippin D, Sarni AR, Rizzo G, Baroni L. Environmental impact of two plant-based, isocaloric and isoproteic diets: the vegan diet vs. the Mediterranean diet. *Int J Environ Res Public Health.* 2023;20(5):3797. doi:10.3390/ijerph20053797
3. Cassidy ES, West PC, Gerber JS, Foley JA. Redefining agricultural yields: from tonnes to people nourished per hectare. *Environ Res Lett*. 2013;8:034015. doi:10.1088/1748-9326/8/3/034015
4. Jennings R, Henderson AD, Phelps A, Janda KM, van den Berg AE. Five U.S. dietary patterns and their relationship to land use, water use, and greenhouse gas emissions: implications for future food security. *Nutrients*. 2023;15(1):215. doi:10.3390/nu15010215
5. Tompa O, Lakner Z, Oláh J, Popp J, Kiss A. Is the sustainable choice a healthy choice? Water footprint consequence of changing dietary patterns. *Nutrients*. 2020;12(9):2578. doi:10.3390/nu12092578
6. Brindis D. Slaughtering the Amazon. June 2009. Accessed March 27, 2024. https://www.greenpeace.org/usa/research/slaughtering-the-amazon/
7. Kozicka M, Havlík P, Valin H, et al. Feeding climate and biodiversity goals with novel plant-based meat and milk alternatives. *Nat Commun*. 2023;14:5316. doi:10.1038/s41467-023-40899-2
8. Smetana S, Ristic D, Pleissner D, Tuomisto HL, Parniakov O, Heinz V. Meat substitutes: resource demands and environmental footprints. *Resour Conserv Recycl*. 2023;190:106831. doi:10.1016/j.resconrec.2022.106831
9. Santo RE, Kim BF, Goldman SE, et al. Considering plant-based meat substitutes and cell-based meats: a public health and food systems perspective. *Front Sustain Food Syst*. 2020;4. doi:10.3389/fsufs.2020.00134
10. Wang Y, Zou L, Liu W, Chen X. An overview of recent progress in engineering three-dimensional scaffolds for cultured meat production. *Foods*. 2023;12(13):2614. doi:10.3390/foods12132614
11. Tuomisto HL, de Mattos MJ. Environmental impacts of cultured meat production. *Environ Sci Technol*. 2011;45(14):6117-6123. doi:10.1021/es200130u
12. Sinke P, Odegard I. LCA of cultivated meat. Future projections for different scenarios. Good Food Institute. 2021. Accessed March 27, 2024. https://gfieurope.org/wp-content/uploads/2022/04/CE_Delft_190107_LCA_of_cultivated_meat_Def.pdf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October 22, 2024

Maine Climate Council
Governor's Office of Policy Innovation and the Future
181 State House Station
Augusta, Maine 04330

Dear Members of the Maine Climate Council,

Thank you for the opportunity to comment on the draft 2024 Climate Action Plan on behalf of NRCM's 30,000 members and supporters across the state of Maine. Since 2020, *Maine Won't Wait* has been a keystone document for decision makers, advocates, and state agencies to guide climate action. It has inspired significant and needed progress on both climate change mitigation and adaptation strategies, and we recognize that it will be critical to advance these strategies with even more urgency in the coming four years.

This draft 2024 Climate Action Plan has many strong elements, and we look forward to working with the administration, legislators, state agencies, fellow advocates, and our grassroots supporters to implement the plan in the coming four years.

NRCM serves on the Energy Working Group, the Transportation Working Group, and the Materials Management Task Force, and we have worked hard in collaboration with other working group members this year to ensure the draft recommendations you received earlier this year incorporated key elements of our vision of a safe and prosperous climate future. We also participated in both the Demand Management Discussion Group and the Land Use Discussion Group, and appreciate the inclusion of these key intersectional issues. We have been paying close attention to the work of the other working groups, task forces, and subcommittees, and have sought to communicate the importance of the emerging Climate Action Plan to our supporter base.

This is a very robust draft plan, and there are myriad recommendations that we strongly support, however, in the interests of focus and brevity, we will not catalogue them all here. That said, there are still several ways in which the plan could be made stronger with more

actionable recommendations before its final publication by December 1st of this year. Thank you for taking our perspective into consideration as you make your final revisions.

**Strategy A: Embrace the Future of Transportation in Maine**

Transportation is the sector that contributes the most annual greenhouse gas emissions (GHGs) in Maine by a good margin, and it is also the sector that Maine has been least successful at addressing over the past four years. It is a challenging sector to reform, and will require concerted and ambitious efforts in the coming four years and beyond.

We are encouraged by the recognition in this plan that progress will require a two-pronged approach to both electrify Maine's vehicles and reduce the total amount of vehicle miles traveled (VMT) year over year by providing viable alternative modes such as active and public transportation. However, there are some notable omissions in the draft plan that were included in discussions within the Transportation Working Group.

- **Reference and support the Public Transit Advisory Council's (PTAC) forthcoming recommendations.** The PTAC releases a biannual report identifying transit needs statewide. The next report will come out on March 1st of 2025 and will include recommendations compiled by the people operating and advocating for Maine's public transit system. The Climate Action Plan should reference and support this body and the recommendations emerging from them. This could include adding a bullet under Strategy A, recommendation #3 that would read: "*Build upon recommendations provided by the Maine Public Transit Advisory Council (PTAC)*."
- **Account for GHG emissions from transportation investments.** It is essential that GHG emissions are modeled for every new transportation project overseen by the Maine Department of Transportation (MDOT) and the Maine Turnpike Authority (MTA), and that modeled GHG emissions decrease year over year. For transportation projects adding new capacity, those modeled GHG increases should be offset by investing in modes, projects, and/or programs that more than offset those modeled emissions, such as public transit and active transportation projects. This could include adding a bullet under Strategy A, recommendation #3 that would read: "*Model greenhouse gas emissions impacts for all transportation projects overseen by MDOT and MTA. For transportation projects adding new capacity, mitigate modeled GHG increases by investing in modes, projects, and/or programs that offset those modeled emissions*."

- **Recommit to reducing (VMT).** It is not clear from the current draft plan that reducing VMT will remain a key priority for Maine. Reducing VMT makes vehicle electrification goals much easier and less costly to achieve, and a 20% reduction in VMT has been identified in 2020 *and 2024* modeling as necessary to achieve our climate goals in Maine. That goal should be as central and prominently stated in this Climate Action Plan as it was in the 2020 plan.
- **Target EV incentives and identify new funding sources for those incentives.** Incentives for electric vehicles (EVs) are a critical part of the plan to increase EV adoption. The Transportation Working Group identified a need to target these incentives, both to low- and moderate-income Mainers and *to those Mainers who drive the most each year*. Additionally, the fund managed by Efficiency Maine Trust to distribute EV incentives will need to be replenished in order to continue providing incentives for Maine drivers. Identifying sources to replenish that funding would be valuable for policy makers.

We would also like to see the language around commitment to improving active transportation strengthened. Removing the phrasing "dependent on federal funding" pertaining to active transportation goals would underscore the importance of the goal rather than highlighting potential obstacles to reaching it. And, especially with the addition of an Active Transportation Partnership Initiative proposal to be launched in 2025, a more ambitious off-road trail goal is warranted.

Additionally, a commitment to a robust, statewide e-bike rebate would unlock the decarbonization potential of e-bikes for many more Mainers. MDOT has seen success managing an e-bike demonstration fleet and conducting a limited e-bike pilot to help people get to work and medical appointments, and we view e-bikes as a transformational tool to increase mobility and reduce emissions in Maine as evidenced here in Maine and elsewhere.

The land use discussion group identified the need for our future transportation planning to prioritize community design to increase transportation options as Maine grows. More emphasis on transit-oriented development and safe walkable, bikeable neighborhoods in Strategy A would strengthen this plan.

Finally, it is clear from the October 16th Emissions Modeling Webinar that targets for EV adoption by 2030 will be adjusted downward. As mentioned above, it is not clear in this plan whether a VMT reduction target of 20% by 2030 will be put forth in this plan as it was in 2020. Given the reduced emphasis on these targets, we hope to better understand from the Maine Climate Council how Maine's mandatory emissions reduction goals for 2030 will be achieved.

**Strategy B: Modernize Maine's Buildings: Energy Efficient, Smart and Cost-Effective Homes and Businesses**

Outside of transportation, buildings are the second largest source of carbon emissions in Maine. Additionally, as they are the places where Maine people and families live, work, play, learn, and do business, buildings are a critical place where climate action intersects with people's daily lives. Here is one suggested improvement to these recommendations:

- **Appliance Emissions Standards.** The plan notes progress in implementing energy efficiency and water conservation standards for certain appliances since 2020. One next step should be the consideration of appliance emissions standards for space and water heating appliances. This could include adding a bullet under Strategy B, recommendation #1 that would read: "*Consider the adoption of phased in zero-emission greenhouse gas standards for space and water heating appliances*."

**Strategy C: Transition to Clean Energy**

Adopting proven clean energy technologies and climate solutions is a practical path forward that will benefit Maine people, our economy, our communities, and our abundant natural resources. Many of the technologies we need to help reduce climate change already exist and will cost Mainers less than continuing our dependence on polluting sources of energy. Our priorities within this sector are to decrease energy burdens for all Mainers, advance the buildout of clean energy resources like solar and offshore wind, increase good-paying clean energy jobs, and support policies that make our electric grid more flexible and reliable.

The recommendations included in this draft align with those put forth by the Energy Working Group, and we look forward to working toward 100% clean electricity by 2040, advancing offshore wind development, and continuing our work on integrated grid planning in the coming years. Here are a few places these recommendations could be improved:

- **Grid edge experimentation and innovation.** In addition to expanding clean energy infrastructure, we also must ensure we are utilizing available technological and rate-based tools to increase the efficiency and reliability of our electric system. There is more opportunity in this plan to emphasize the importance of continued innovation and experimentation with the electric grid to reduce rates and increase efficiency. A bullet under strategy C, recommendation #2 that states: "*Create*

*regulatory frameworks to encourage innovation and experimentation in deploying and studying the impacts of grid-edge technologies in advance of wider adoption."*

- **Time varying rates.** As our society electrifies and electricity demand increases due to the electrification of heating and transportation, the utilization of time of use rates to manage demand and lower system costs will be a critical tool in better matching the price of electricity with the cost of electricity. We hope to see more focus on residential time of use rates as an opportunity to save money for Mainers and lower peak demand growth as we electrify. The words "rate design" could be added to bullet 2 under strategy C, recommendation #3, and, including "including residential time of use rates" at the end of the first sentence in the penultimate paragraph under strategy C, recommendation #3.
- **Just transition.** The clean energy transition is the biggest opportunity Maine has seen in decades to grow our workforce with family-sustaining jobs. Now is the time to ensure that clean energy jobs of the future come with high pay and labor standards. This plan should speak to ensuring that this transition is a just transition for Maine's workforce.

**Strategy E: Protect Maine's Environment and Natural and Working Lands and Waters**

The draft provides important and strong recommendations in support of expanding conserved land in Maine to 30 percent of the state by 2030. We appreciate and support the emphasis in the first recommendation to focus land conservation on areas with rich biodiversity, carbon storage potential, and lands with cultural and economic importance, and lands that improve equitable public access. We suggest small edits in this section to emphasize the role of the state's existing system of Ecological Reserves, and the importance of recreational access. This could look like the following edit to the first bullet under Strategy E, recommendation #1:

- *Focus on areas that are richly biodiverse and~~;~~ have high potential to draw back and store carbon, such as Ecological Reserves; are culturally and economically important to communities statewide;~~;~~ and/or that can improve equitable public access for a full range of recreational activities enjoyed by Maine people and visitors.*

We also appreciate the focus on generating sufficient funding to achieve a significant increase in conserved lands that will benefit Maine' environment, climate, economy, and people. The Natural and Working Lands Working Group identified the need for $50 million annually to meet the 2030 goal, including through identification of an ongoing funding

source. We suggest amending the proposed draft language under Strategy E, recommendation #1 to include these additional specifics, as follows:

- *Significantly expand the funding and eligibility for fee and easement acquisition through existing and new land conservation programs, with a goal of providing $50 million annually through public and private sources and establishment of an ongoing funding source ~~including~~ for the Land for Maine's Future Program.*

Regarding Strategy E, recommendation #4 on reducing food waste, while requiring annual reporting of food waste from large generators is a good start, it won't necessarily achieve the goal of reducing landfill waste and boosting food donations. Maine has long explored reducing food waste but has yet to take the necessary step of requiring food waste separation and banning its disposal in landfills. States like Vermont, Connecticut, and New Jersey have seen quick success with such bans, leading to increased food donations and investment in rescue infrastructure. With clear liability protections already in place and many examples of success in other New England states, Maine should act now to reduce emissions by requiring diversion of food waste from landfills.

Methane is a potent greenhouse gas, and reducing its emissions must be a top priority. We're pleased the council plans to monitor and reduce these emissions by 2030 as outlined under Strategy E, recommendation #7, but time is running out. Banning the landfilling of high-methane organic waste and requiring methane capture at landfill sites are proven solutions. Rather than relying on voluntary measures or subsidies, the state should **ban organic waste disposal** and **mandate methane capture** at all landfills. Landfill operators should internalize these costs and not be given subsidies for doing the right thing, freeing taxpayer dollars for other essential climate mitigation efforts where cost internalization isn't an option.

**Strategy F: Build Healthy and Resilient Communities**

We're glad the council recognizes municipalities' responsibility in providing waste reduction, reuse, and recycling services, along with the need for funding and technical support. However, the draft should also reference Maine's **Extended Producer Responsibility for Packaging Law**, designed to provide ongoing support for these services. When fully implemented in 2026, this law will offer continuous funding without relying on taxpayer dollars, unlike one-off grants such as the one for ecomaine that was

described in the draft. We urge the council to highlight this transformative policy under and encourage participation from towns and cities under Strategy F, recommendation #10.

Broadly speaking, there are a few additional recommendations for future iterations of Climate Action Planning that we hoped to share: First, it would be prudent to conduct emissions modeling and share the results of that modeling prior to the conclusion of the working group convenings. This information would meaningfully inform the strategies put forth by the working groups, particularly those in the Transportation, Buildings, and Energy working groups with an eye toward emissions reduction strategies. Similarly, the good work of the Mitchell Center to incorporate data-informed equity perspectives arrived too late for the working groups to meaningfully incorporate the findings into their recommendations. It is our hope that a partnership with the Mitchell Center will extend through the next four years to ensure the equitable implementation of the plan, including regular feedback from priority communities that will help to inform future iterations of the plan. Finally, while we appreciate the opportunity to comment on the draft plan, the comment window was particularly short relative to the length and complexity of the draft plan.

We thank the Maine Climate Council for their hard work to arrive at this juncture, and appreciate your consideration of our comments.

**From:** Derek Pelletier
**To:** Maine Climate Council
**Subject:** Public comment on draft strategies
**Date:** Wednesday, October 16, 2024 1:07:15 PM



Council members:
I'm a long-time resident of Portland with two children. While I count myself as very fortunate to be able to live and make a living here in Maine, I am frustrated at the lack of foresight in our transportation system. It is exceedingly difficult to live here without owning or having regular access to a personal vehicle. While this is a great situation for auto-manufacturers and, most significantly, the fossil fuel industry, it is a terrible situation for Mainers. As you know, the transportation sector is the largest source of greenhouse gas emissions in the state. I appreciate the strategies around expansion of zero and low emission vehicles but am disappointed with the lack of any coherent strategy about what really needs to be done to meet our emissions goals - that is reducing vehicle miles travelled.
Your strategies about expanding the mode share for public transportation as well as active transportation are destined to fail if we continue to invest in a transportation system that prioritizes single-occupant vehicles over all other modes as we have done for >100 years. At the very least, the climate council needs to articulate a strategy to do no further harm - that is, avoid investing in any projects that increase the vehicular capacity of our roadways. Indeed, the state's Turnpike Authority is currently working on a project that will further lock-in our reliance on personal vehicles in the very part of the state that has the density to support more public transportation. Any idea that constructing the Gorham Connector will create "room for transit" is absurd and runs counter to evidence from the past 100 years of transportation infrastructure investment. Public transit needs demand to succeed and increasing vehicular capacity will only eliminate that demand.
The state's Climate Action Plan needs to be much stronger on this issue of changing how we prioritize our investments in transportation or we will never achieve our climate goals.
Thanks for your attention.
Best,
Derek Pelletier
28 Rosemont Ave
Portland

**From:** Dan Reed
**To:** Maine Climate Council
**Subject:** Climate Action Plan Feedback
**Date:** Wednesday, October 16, 2024 1:17:45 PM

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Hello!

I am a member of this year's Leadership Maine class, and we are doing a report on the Maine Climate Action Plan.

I noticed in the plan that there is no attempt to expand train travel into and around Maine. As I dug deeper, I noticed that train travel is being actively discouraged in the state.

I'm just wondering why this is the case?

It seems extreme to me that the goal of the plan for transportation is 1) ask people to buy Electric Vehicles and 2) not drive them.

I live in Bath, and we lose power for days at a time, around 5 times a year. Relying solely on personal electric vehicles would be dangerous.

Does the Climate Action Plan intend to address these issues?

**Dan Reed**
*Marketing & Program Manager*
**SCORE Maine**

*SCORE – For the Life of Your Business*
Cell Phone: 207-251-9819

Freedom Studies

Climate Contrarian

Maine's draft climate action plan update is posted at Maine-Wont-Wait-Draft-10.15.24.pdf .

It doubles down on expensive and unreliable energy (solar and wind), electric vehicles, youth indoctrination (climate corps anyone?), damaging rural Maine, moral preening and refusing to tell the people of Maine how much global warming will be averted (none) and at what cost (bend over).

I will be having at least three bills submitted in response, led by An Act to Promote Sound Science and Transparency in Climate Change Policy.

Five years ago, one of my first columns laid out the basics and provided a truth-in-labeling preview. That September 2019 Climate Contrarian column did not make it to the web, so, here is a slightly revised version:

*In 2004, I served on a Department of Environmental Protection (DEP) Climate Policy taskforce examining how Maine might implement the August 2001 New England Governors/Eastern Canadian Premiers (NEG/ECP) Climate Change Agreement (CCA) to reduce our Greenhouse Gas Emissions. The CCA was an updated regional version of the 1998 Kyoto Protocol signed by President Clinton. The Senate had not and would not ratify Kyoto and President Bush had "unsigned" it, but then Gov. Angus King and New England's Governors had pushed back with their own agreement to fight climate change alongside Quebec and the Maritime provinces. The NEG/ECP entity was created by and remains a front for the New England Independent System Operator (ISO), which runs our electric grid, principally Central Maine Power and Bangor Hydro (now Versant) here in Maine. Gov. Baldacci and the Maine's Democratic legislature had adopted the CCA emission reduction goals into statute, and the DEP was trying to figure out how to implement them. I became increasingly alarmed when it became apparent that the DEP was unwilling to tell Mainers how much global warming their emission reductions would prevent and how much it would cost.*

*After the November 2004 election, I asked my friend the late Rep. Henry Joy (R-Crystal), who ran for the Republican nomination for Governor in 1998 and was a leader in the "Two Maine's: (as in Maine and Northern Massachusetts) movement, to submit the following bill to the legislature:*

## An Act to Promote Sound Science in Climate Change Policy

**Be it enacted by the People of the State of Maine as follows:**

**Sec. 1. 38 MRSA §579** is enacted to read:

**§579. Rules designed to reduce greenhouse gas emissions**

When adopting rules designed to reduce greenhouse gas emissions, the department shall issue an estimate, calculated using sound scientific information and methods, of:

**1. Reduction in global warming.** The amount of global warming that will be prevented by the reduction in greenhouse gas emissions; and

**2. Costs.** The costs associated with the reduction in greenhouse gas emissions, including the impact on the prices of gasoline, diesel fuel, electricity, heating oil and propane.

**SUMMARY**

This bill requires that, when the Department of Environmental Protection adopts rules designed to reduce greenhouse gas emissions, the department must issue an estimate of the amount of global warming that will be prevented and the costs that will result from the rules requiring reduction in greenhouse gas emissions.

*The bill was christened LD72 and is available at http://www.mainelegislature.org/legis/bills/bills_122nd/billtexts/LD007201-1.asp . The title, sponsors (2nd Congressional District Republicans) and content of LD 72 drove the environmental left and climate alarmists crazy, but its conciseness, clarity and ease of understanding made defeating it problematic. The climate alarmist narrative was already declaring that the science was settled and that global warming (soon to be climate change and now climate crisis/catastrophe) was an existential apocalyptic threat. The alarmists were loath to admit that according to their own (apocalyptic) models the proposed emissions would avert essentially no detectable global warming, or that the emissions reductions would significantly raise energy prices. Kyoto 's global reductions would have averted less than 14 hundredths of a degree Centigrade over the next 100 years; Maine' proposed reductions would do even less by at least three orders of magnitude. Since the science was "settled", they could hardly argue that it would be impossible or too costly to estimate the amount of global warming averting, something the fiscal note to the bill (minor cost increase) recognized.*

*The hearings on LD 72 were quite the show. Maine's business community and national advocates for free markets and capitalism strongly backed the bill. The environmental left howled that it was a right wing /Koch brothers effort to destroy the planet. The Baldacci administration did not know what to do. For a brief moment, I wondered whether we might be on the verge of a bi-partisan environmental legislation breakthrough that could set the stage for an honest and effective climate change policy in the years to come. It was not to be.*

*The environmental left and legislative Democrats substituted and passed a completely amended bill with a very different title, charging the DEP to report bi-annually on how cost effective their emission reduction efforts were, with no mention of how much global warming had been averted and at what cost. To this day, I don't believe any such report has been made, and the climate alarmists report only how many metric tons of carbon "pollution" emissions have been averted, never how much climate change (none) or at what cost (substantial).*

*Here is the amended title and bill:*

Further amend the bill by striking out everything after the enacting clause and before the summary and inserting in its place the following:

# An Act To Review Climate Change Policy Effectiveness
(TITLE CHANGE)

'**Sec. 1. 38 MRSA §578,** as enacted by PL 2003, c. 237, §1, is amended to read:

**§578. Progress evaluation**

By January 1, 2006 and by that date every 2 years thereafter, the department shall evaluate the State's progress toward meeting the reduction goals specified in section 576, review the cost-effectiveness of the actions taken toward meeting the reduction goals and shall amend the action plan as necessary to ensure that the State can meet the reduction goals. The department shall submit a report of its evaluation to the joint standing committee of the Legislature having jurisdiction over natural resources matters by January 1, 2006 and by that date every 2 years thereafter. The joint standing committee of the Legislature having jurisdiction over natural resources matters is authorized to report out legislation relating to the evaluation to the second regular session of any Legislature. Starting no earlier than January 1, 2008, the department may recommend to the joint standing committee of the Legislature having jurisdiction over natural resources matters that the reduction goals specified in section 576 be increased or decreased.'

**SUMMARY**

This amendment is the majority report. The amendment replaces the bill and changes its title. It directs the Department of Environmental Protection to include in its biennial climate change evaluation a review of the cost-effectiveness of the actions taken toward meeting the greenhouse gas emissions reduction goals. It also requires the department to submit a report of its evaluation to the joint standing committee of the Legislature having jurisdiction over natural resources matters and it authorizes the committee to report out legislation relating to the evaluation to the second regular session of any Legislature.

http://www.mainelegislature.org/legis/bills/display_ps.asp?ld=72&PID=1456&snum=122#sec0

The climate alarmists may well succeed in destroying capitalism, rural Maine, freedom and prosperity, but some of us are not going to surrender without a fight.

SIERRA CLUB
MAINE CHAPTER

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**Memorandum**
**To: Amalia Siegel, Maine Climate Council**
**From: David von Seggern, Co-lead, Sierra Club Maine, Clean Energy Team**
**Date: September 20, 2024**
**Subject: Energy Working Group report to Maine Climate Council**

We are pleased to submit comments on the Energy Working Group's report to the Maine Climate Council, dated June 5, 2024. The Energy Working Group's report was accessed via the Governor's Office of Policy Innovation and the Future webpage where comments on the draft reports are solicited.

The Sierra Club Maine's members and supporters strongly support the work of the Maine Climate Council. We are pleased to see the Council moving into its second four-year plan to mitigate the effects of climate change in Maine, to accelerate the energy transition to renewable energy sources, and to assure that the transition is just and equitable.

**p. 2-4 — Summary of recommendations:** We agree in general with the four recommendations of the Energy Working Group (EWG) summarized here.

However, the recommendations apparently assume that electrification of Maine's energy consumption will happen without major intervention by local and state governments. Given the urgency now of converting our energy consumption to renewables due to the climate crisis and the fact that powerful private entities are working to maintain their long-standing fossil-fuel market share, concerted public opinion will be required to hasten the energy transition. This will, in many cases, require more intervention than this document recommends. Such intervention may only be possible with a greater public awareness of the immediacy of the climate crisis and an understanding of the solutions available to us. Governor Mills signaled the urgency that should pervade our approach with her February 2023 address to the legislature, as shown on p. 11 of the Energy Working Group's report. We therefore believe that the EWG **must recommend,** among other approaches:

- increase in funding for public-school curricula to contain lessons on climate change, its cause through energy-use emissions, and how it affects Mainers
- increase in staff within the Governor's Energy Office to handle new and important duties related to climate change
- increase cooperation with business and industry in Maine to promote renewable energy and to promote conversion to electric appliances and electric vehicles

- expansion of the role of the Efficiency Maine Trust to accelerate the energy transition among low- and middle-income residents

**RECOMMENDATION 1:** *Decrease energy burdens for Mainers by reducing barriers to participating in the state's energy transformation.*

p. 5 — Actions C and D under Recommendation 1 are certainly needed. However, there must be some review and input from the low-income stakeholders to ensure that the "energy navigator program" is indeed easy to understand and navigate. Failures of federal government programs such as SNAP to enroll eligible people can be blamed on digital web interfaces that are sometimes inaccessible and then not user-friendly when accessed, especially when dealing with people in the low-income socio-economic range. We must supply a system that works easily for people.

p. 6 — Action A discussion here is too much focused on "reducing energy burden" in the sense of costs. It should equally put the focus on reducing and changing energy consumption for low-income households through weatherization and appliance replacements where "appliance" includes heating and mode of transportation. The savings in cost will come naturally when those reduction targets and transition targets are met. This is alluded to in the last paragraph of p. 6; however, there it must be added that "cost-prohibitive" refers to low-income households in particular.

p. 6 — We very much agree with extending studies of energy burden to non-electrical energy consumption.

p. 7 — While the financing and ownership models mentioned here are certainly desirable, we offer two cautions. First is that solar programs in particular can be errantly designed such that households don't reap much of the benefit while installers mostly enjoy the benefit, in terms of cost. Reports of such outcomes are common; for instance the article by *Time* magazine. Second is that the subscriber model to solar farms has been demonstrated by Maine's Office of Public Advocate to not lower subscribers' electricity bills while at the same time to raise electricity rates for all ratepayers. We look forward to further reforms to address these shortcomings while keeping the basic benefit of net energy billing as a means of increasing solar penetration into our electricity supply.

p. 8 — The emphasis on immediate relief on energy bills must be tempered with pathways to assistance that will reduce the energy consumption of those households having difficulty paying high energy bills. Energy payment assistance only helps with the symptoms and does not help with a cure. Technical solutions that reduce energy consumption are available, and we need to have programs that enable low- and middle-income households to acquire these solutions.

p. 9 —Action A (comprehensive assessment of residential energy burden) should be repeated every 3 years to align with the scheduling of the Triennial Plan of the Efficiency

Maine Trust, where many of the solutions advanced in the Climate Action Plan can be implemented. Furthermore, should we put the entire Maine Climate Council update on a 3-year schedule instead of a 4-year schedule in order to align it with the EMT Triennial Plan?

**RECOMMENDATION 2:** *Advance policies that support timely and cost-effective planning and buildout of necessary clean energy infrastructure to meet state goals and statutory requirements including 100% clean electricity by 2040.*

p. 12 — Action E is certainly needed. It should be stated here the importance of regional planning and cooperation to optimize this. The signing by the GEO director of the multi-state MOU on grid planning is a good first step and must be followed by a developing a culture of cooperation to reach common goals across the region with regard to electrification. It should be stated that the underlying premise is that Maine aims to electrify nearly everything in the long term in order to decrease our dependence on fossil fuels and meet the goals already established in Maine statutes related to clean energy.

p. 13 — Actions D and F under Recommendation 2 are certainly needed. However, we must aim to do better at identifying and utilizing brownfield sites for solar arrays and battery storage. We must also do better in siting solar and wind farms such that there is no net loss of carbon-sequestering lands through siting regulations being developed by the Maine Department of Environmental Protection (Rule 375 revisions).

**RECOMMENDATION 3:** *Develop and implement demand management and innovative load flexibility strategies and technologies to support energy reliability and resiliency, reduce electricity peaks and overall system costs, accelerate beneficial electrification, and reduce emissions.*

p. 16 — Actions A to D under Recommendation 3 are certainly needed. Effective demand management will require some legislative initiatives, and the Maine Climate Council (MCC) should be a promoter in this regard. Item D is particularly important, and all parties need to be aware of the importance of demand management. We are no longer in the age where expansion of electrical power infrastructure to meet all needs at all times is necessary or wise. Ideally, there would be mechanisms empowering the PUC to deny electrical service upgrades for entities that don't meet a basic measure of benefit to society.

p. 17 — Action A calls for "flexible loads". However, just as important for grid resiliency and reliability are "flexible generators", and no mention is made of this. The EWG needs to identify the fact that microgrids, especially when paired with battery storage, can be effective suppliers of electricity locally when transmission systems are badly impacted by storms or otherwise. Future grid planning must think broadly in terms of distributed generation, from industrial solar and wind farms to individual rooftop solar, backyard

wind generators, and EV batteries. Immediacy is important here, as failure to incorporate these capabilities into early grid planning will prevent us from reaping their benefits in the long term.

p. 17 — Under Action B, we recognize that Pathway to 2040 is the document that will outline the types of electricity demand management that could be implemented. The EWG should recommend that Maine take the big step toward demand management: an opt-out electricity pricing structure that rewards shifting energy demand to off-peak times. There are two tangible benefits from such an approach: 1) individuals and businesses can reduce their electricity bills by taking advantage of off-hours pricing and 2) all ratepayers can share in lower infrastructure costs to meet a time-of-day and seasonal balanced electrical load. The pilot programs within the Efficiency Maine Trust (EMT) are an impetus for such a recommendation. We should, of course, examine the results of these programs, but consensus is already rising that the benefits of off-peak pricing in electricity supply and distribution are so clearly understood now that it should be instituted in Maine as soon as possible.

p. 17 — We fully endorse Action C which will ensure that low- and moderate-income households are not left out of the benefits of electrical demand management.

**RECOMMENDATION 4:** *Attract, prepare, and position people and businesses to participate in Maine's clean energy economy with a goal to support 30,000 clean energy jobs by 2030.*

p. 20-21 — We fully support the Recommendation 4 actions. Action F under it is especially important. As we make more demands to hasten the energy transition, we must make sure that those disproportionately impacted are able to take advantage of pathways to jobs in the green-energy economy.

**From:** David von Seggern
**To:** Siegel, Amalia
**Subject:** Comments on Natural and Working Lands Work Group report to the Maine Climate Council
**Date:** Friday, September 20, 2024 5:01:55 PM



I am submitting the following comments in regard to the Maine Climate Council's
update plan.

David von Seggern
Westbrook, ME

I am pleased to comment on the Natural and Working Lands Work Group report to the Maine Climate Council. The draft report was accessed via the Governor's Office of Policy Innovation and the Future webpage where comments on the draft reports are solicited.

p. 2 — 2nd bullet mentions "forest cover, agricultural lands and coastal areas". The general understanding of the meaning of the first two of these three is fairly good, but "coastal areas" needs to be defined in this Introduction for clarity.

p. 2 — definition of "conserved lands": Farmland is highly altered land that cannot be considered as "conserved" in the environmental sense. Using farmland conservation as a facet of the important 30x30 conservation goal is troublesome at the least and bizarre at the most. It is conceivable that portions of working farms could be considered "conserved" for climate-change mitigation, but only if those portions of land were durably designated to be returned to their natural state or durably designated to remain in that state if they are already. Several of the values listed in the definition are appropriate for conserved land, but "food security", "cultural opportunities", and "economic opportunities" are not. Farmlands are only marginally more appropriate for 30x30 targets than lands developed for residential, business, or industry usage in urban or suburban areas. Natural areas which become farmlands carry a high penalty on carbon sequestration (Lal et al., https://www.jswconline.org/content/jswc/73/6/145A.full.pdf) and may in many situations be as bad as, or worse than, developed areas. To a lesser extent, managed forest areas also carry a carbon sequestration penalty (New England Forestry Foundation, https://newenglandforestry.org/publications/fccl-report).

p. 2 — the geography of conserved lands: We strongly support the statement that "The benefits of conserved land should be equitably distributed and inclusive..." All of our policy actions should strive to fulfill this principle.

p. 2 — "... no net loss": We believe that the Maine Department of Environmental Protection now has the tools that will fairly well measure gains and losses in GHG emissions from different land types and uses. Besides the importance of

measuring net GHG emissions, the ability of MDEP to quantify the worth of different lands in the GHG equation will help to guide decisions on protecting land. A recommendation that MDEP have the staff and resources to amply carry this out is important.

p. 2 — Recommendation 1: Priorities: This recommendation should stop at the word “sequestration” because the factors in the remainder of the sentence may actually lead to less carbon sequestration.

p. 3 — “Beginning with Habitat Focus Areas of Statewide Ecological Significance...” : This phrase should be accompanied by a reference as it apparently points to another document.

p. 3 — Recommendation 2: Farmland: "Working lands" have been erroneously folded into the goals of 30x30. Farmland does not meet the definition of 30x30 documents such as the Kunming-Montreal Global Biodiversity Framework (https://www.cbd.int/doc/decisions/cop-15/cop-15-dec-04-en.pdf) and the White

House’s America the Beautiful report (https://www.doi.gov/sites/doi.gov/files/report-conserving-and-restoring-america-the-beautiful-2021.pdf). We agree that farmland conservation is a laudable goal, but it should be achieved under a separate state initiative that recognizes the need to produce food locally. As revealed up front in this document, Maine’s farmlands comprise only about 1.7% of the land area of the state. Excluding this from the goals of 30x30 will hardly deter achieving those goals which can be logically reached by attending to other lands within the state.

p. 4 — Recommendation 3: Funding: We support the means expressed here for expanding conservation lands. We believe another point should be added. Most of the acreage which has been recently and durably converted to conserved lands has flowed from private ownership to land trusts or government entities. The state should support official activities beyond those in the Land for Maine’s Future Program to enable a faster rate of conserving land in private ownership or of moving private land to public or trust ownership. Such efforts may go beyond what local trusts and municipalities are able to muster. Indeed, such state support will address much of the objective expressed in the following Recommendation 4: Capacity.

p. 6. — Resilience: We agree with the statement “Conserved lands increase the resilience of the landscape.” Later in this paragraph, it is stated that “In addition, farmland conservation contributes to the resilience of Maine’s food system...” While we agree with the latter statement, we again point out that farmland conservation should be approached in an entirely separate document because it has a different purpose.

p. 6 — “$1.5 billion of funding could be required over six years”: That number should be broken into $250 million per year. In comparison of that annual figure with the annual budget of Maine for FY2025 of $ 5.4 billion, one sees a challenge because $250 million would be nearly 5% of the current Maine budget. This report needed to clearly say that.

p. 16 — “Forest Carbon Recommendations”: We strongly support the bulleted principles listed at the top of this page. We believe though that a further principle should emphasize the need for conversion of currently managed forest to natural forest for a significant portion of Maine’s forest. The carbon-sequestration benefits of truly natural forest versus managed forest are well known (New England Forestry Foundation, https://newenglandforestry.org/publications/fccl-report). For carbon sequestration it is not simply the quantity of forest, but just as importantly its quality. Most often this quality cannot be fully achieved in managed forests.
p. 16-17 — “Recommendations”: Despite the worthiness of the recommendations listed under 1a - 1g, their fulfillment are unlikely to restore managed forests to the carbon-sequestration potential of natural forests (with perhaps limited thinning); thus the need for actions as suggested in our comment on p. 16 above.
p. 18 — “With further funding...”: Some of the important work with GIS technology to describe the current uses and conditions of lands is being done by NPOs such as The Nature Conservancy. Those organizations should also be included in the discussions about forest management to improve carbon sequestration.
p. 19-20 — “Measuring outcomes”: We would add to this recommendation that GIS technology and up-to-date satellite observations are essential tools in measuring the utility of various programs and initiatives. The state agencies responsible for measuring the carbon-sequestration potential of natural and working lands must utilize best available technology.

p. 22 — under “Impacts”, “Adaptation and Resilience”: Surely the authors meant “decrease” rather than “increase”.

MAINE WON'T WAIT comments from Sean Tarpey

Strategy E  Point 4 Monitoring

Since the four year plan was developed we have been seeking the right opportunity to participate in the monitoring and data collection that was outlined in the plan.  MST has built a autonomous monitoring buoy the likes of which is not commercially available in Maine.  The four year plan calls for the state to "create the framework and begin pilot for a comprehensive monitoring system by 2024".  MST had created the critical tool for this pilot.  How do we get this tool in the right hands?

Water and air pollution

Strategy A Points 1 Electric Vehicles and 2 Fuel efficiency and Alternate Fuels

The Four year plan needs to expand the horizon a little and include marine transportation (boats) in the definition of Vehicles.  Maine ranks 4th in the nation for per capita boat ownership.  Motorized boats contribute a shockingly high amount of carbon and green house gas pollution to the coastal waterways and lakes of Maine.  The working waterfront of Maine functions by operating boats of all sorts.  Only a tiny handful are powered by battery.  This has to change, and change quickly.  It is critical that Maine's working waterfront embrace electric propulsion systems as well as charging stations and properly trained technicians for installation and repair.  Government funding is needed to get this program started.  Amsterdam has banned the use of internal combustion boats in the city center as of 2025.  They know what they are doing!

**From:** Eliza Townsend
**To:** Maine Climate Council
**Cc:** Beal, Amanda; Abello, Thomas; Cutko, Andy
**Subject:** draft Maine Won"t Wait update
**Date:** Wednesday, October 16, 2024 4:33:55 PM
**Attachments:** image001.png

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Dear Ms. Siegel and N&WL co-chairs Beal and Abello,

When I received the link to the draft update to Maine Won't Wait, I eagerly raced to Strategy E: Protect Maine's Environment and Natural and Working Lands and Waters. I was disappointed to find the recommendation to establish a permanent, ongoing funding source for Land for Maine's Future buried in paragraph 4 rather than bulleted, in bold type, under the heading "Increase the total acreage of conserved Natural and Working Lands in the state to 30 percent by 2030" on page 35. This is where I believe it belongs. I don't recall disagreement on that point, and it will be challenging to meet the 2030 goal as it is, more challenging without secure funding. Highlighting the recommendation is a strong first step toward that goal.

Thanks,

**Eliza Townsend**
she/her
Maine Conservation Policy Director
etownsend@outdoors.org
207.699.9815
Writing to you from Leeds, ME

**From:** Alex Zipparo
**To:** Maine Climate Council
**Cc:** Susie Arnold
**Subject:** Draft MWW Comments
**Date:** Friday, October 18, 2024 1:29:33 PM

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Dear Maine Climate Council,

Please accept the following additional suggestions for the draft climate action plan. These comments are specific to unbridged islands, so it may seem like a small and specific population, however I think it presents an opportunity for great impact and a model for the rest of Maine.

- Increase the use of shared use vehicles for island residents and visitors to decrease reliance on single-occupancy vehicles and car ownership through coordination and education.
- Increase incentives to improve emissions for marine transportation, especially in non-DOT ferry service.
- Foster multi-modal transportation coordination planning for unbridged island visitors and residents to reduce vehicle reliance through coordination and education.

**Alex Zipparo, MPA** (they,them)
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