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# Analysis: Global Agreements Must Include a Just Transition Away From Industrial Animal Production to Succeed



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The global system of industrial animal production, including industrial fishing and aquaculture, is fundamentally inequitable, inefficient, financially flawed and environmentally unsustainable. It is a leading source of greenhouse gas emissions, air and water pollution, habitat loss and degradation, biodiversity loss, and exploitation of people and animals. As such it is incompatible with global agreements to address the climate emergency, sustainable development and the biodiversity extinction crisis.

The *Just Transition From Industrial Animal Production to Equitable, Humane and Sustainable Food Systems* white paper and roadmap<sup>1</sup> outlines three key levers of change: strengthen food system governance, promote agroecological practices, and shift towards diets within planetary and social boundaries. This analysis shows how the just transition outlined in the white paper and roadmap is not only compatible with key global agreements but integral to their success.

This just transition primarily applies to industrialised production and agribusinesses. It recognises the role of culturally appropriate meat consumption and the economic, social, nutritional and cultural significance of traditional livestock and pastoralist systems in certain contexts and communities. It acknowledges the pressure industrial meat, dairy and seafood multinationals put on industrial farmers and fishers who are seeing their income decreasing and their way of life disappearing. At the same time, it recognises the essential role of smallholders farmers, pastoralists, small-scale fishers, women, Indigenous peoples and peasants in providing healthy and nutritious food for all.

The just transition is an opportunity to address and advance the conditions and livelihoods of these groups, including industrial farmers, by improving the current system through the adoption of agroecology, high welfare standards and the recognition and strengthening of food system governance, including traditional land rights of smallholders and marginalised groups, particularly women, people of colour and Indigenous communities.

Equitable, humane and sustainable food systems are climate-resilient and governed through local, inclusive and democratic participatory processes. They reduce greenhouse gas emissions, support biodiversity, protect animal welfare, empower workers and promote food sovereignty that ensures food security. By doing so, these systems generate positive social, economic and environmental outcomes that are necessary to achieve the goals of key global agreements.

For this analysis, we looked at the Paris Agreement, the Sustainable Development Goals, the Methane Pledge, and the Kunming-Montreal Global Biodiversity Framework. We found that the just transition framework is not only aligned with but a critical part of achieving the Paris Agreement, the Methane Pledge, and nearly every Sustainable Development Goal and target of the Kunming-Montreal Global Biodiversity Framework.

## Meeting the Paris Agreement goals

In recent years agriculture has been increasingly recognized both as a major contributor to climate change and as a sector that will be significantly affected by it.

Estimates of the contribution animal agriculture makes to global GHG emissions range from 11.2% to 19.6%<sup>2,3</sup> and are far higher when factoring in emissions from land conversion for animal feed production and grazing<sup>4</sup>. The biggest 15 dairy and meat companies produce a staggering quantity of emissions, amounting to approximately 734 million tons of CO<sub>2</sub> equivalent. This is roughly the same as the total GHG emissions of Germany, the world's fourth-largest economy<sup>5</sup>.

Industrial fishing, specifically bottom trawling, releases massive amounts of carbon that would otherwise be stored in the seabed. It also causes ocean acidification and reduces the ocean's ability to store carbon dioxide. In industrial aquaculture, climate impacts include the destruction of carbon-sequestering ecosystems such as mangroves for shrimp farming, the emissions from fishing, and the transport and processing of feed for farmed salmon. In fact, scope 3 emissions<sup>6</sup> account for over 80% of all GHG emissions in salmon farming, 40% of which comes from feed<sup>7</sup>.

Addressing agricultural emissions is critical to ensuring food security. Increasing temperatures, less-productive soil and unreliable rains significantly impact crop yields<sup>8,9</sup>, lower the nutrient density of some crops<sup>10</sup>, and increase the risk of heat stress<sup>11</sup> in grazing animals, leading to higher mortality and lower productivity<sup>12</sup>. These challenges have an even greater impact on small-scale farmers, particularly in the Global South where industrial livestock systems are replacing traditional forms of livestock production<sup>13</sup>.

The Paris Agreement requires countries to establish, maintain and publish nationally determined contributions (NDCs) that detail how much a country plans to reduce its emissions in line with the



goals of the Paris Agreement.

Although the text of the Paris Agreement does not mention agriculture, it does highlight food security, hunger and the vulnerability of the food production system to climate change. Its preamble makes clear that the global community must address the effects of agriculture on climate change and build resilience to enhance food security globally.

Until the 23rd UNFCCC Conference of the Parties (COP23), there was no formal decision specifically addressing agriculture within the COP framework. COP23 established the Koronivia Joint Work on Agriculture to tackle agricultural issues, and it has since evolved into the Sharm El Sheikh Joint Work on the implementation of climate action on agriculture and food security (COP27). The last COP presidencies initiated food and agriculture initiatives, the most significant being the Emirates Declaration on Sustainable Agriculture, Resilient Food Systems and Climate Action led by UAE COP 28 presidency and endorsed by 160 countries, calling for integrating agriculture and food systems programs and plans with NDCs and National Adaptation Plans (NAPs).<sup>14</sup> The COP28 also saw significant advancement in recognizing the impact of climate change on the sector in the COP28 “UAE consensus” outcome document<sup>15</sup>. In particular, paragraphs 55 and 63(b) in the adaptation section of the Stocktake call for the “implementation of integrated, multi-sectoral solutions, such as land use management, sustainable agriculture, resilient food systems,” and promoting “climate-resilient food and agricultural production and supply and distribution of food, as well as increasing sustainable and regenerative production and equitable access to adequate food and nutrition for all.” However, it fails to explicitly mention food systems and agriculture in the mitigation section, paragraphs 33-36 on nature, ecosystems, oceans, and sustainable consumption patterns that relate directly to food and land use<sup>16</sup>.

Despite increased attention to the issue, very few countries’ NDCs meet the level of ambition needed to cut emissions from our food system. The Global Stocktake shows that current NDCs only provide



for 5.3% emissions reductions by 2030, and only if all nationally determined contributions, including all conditional elements, are fully implemented. This is far short of the 43% needed to limit global warming to 1.5°C<sup>17</sup>.

The Global Stocktake decision calls on governments to develop ambitious, economy-wide emissions reduction targets, covering all greenhouse gases, sectors and categories and aligned with limiting global warming to 1.5 °C. Global food systems emissions driven by unsustainable industrial animal agriculture, fishing, and aquaculture will make it impossible to achieve the 1.5°C target even if fossil fuels are immediately phased out<sup>18</sup>. According to experts, global emissions from animal production must decline by 50% by 2030 to meet the targets of the Paris Agreement<sup>19</sup>.

Building on the Global Stocktake, and the UAE Declaration and Consensus, it is urgent to raise the ambition of the NDCs to integrate both mitigation and adaptation measures for the animal agriculture sector to mitigate emissions coming from unsustainable industrial systems through a shift towards diets within social and planetary boundaries whilst adapting traditional systems to the impact of climate change through the adoption of agroecology.

The Paris Agreement and the different components that NDCs may contain were reviewed against the recommended levers in the just transition white paper, with a focus on six key articles: Mitigation (Article 4), Adaptation (Article 7), Finance (Article 9), Technology Development and Transfer (Article 10), Capacity Building (Article 11) and Transparency (Article 13)<sup>20</sup>. Entry points have been identified instead of targets or indicators, because these differ in each country taking into account UNFCCC’s “common but differentiated responsibilities” principle under which countries are responsible for addressing global environmental destruction yet not equally responsible, in view of the different contributions to global environmental degradation<sup>21</sup>.

## **Lever 1: Policies to strengthen food system governance**

Policies under this lever focus on reshaping financial flows, ensuring accountability, and supporting adaptation measures, aligning with the overarching goals of the Paris Agreement to mitigate climate impacts and promote sustainable and resilient development.

This lever is key to put the policies in place to create an enabling environment for a just transition, ensuring minorities, frontline communities and workers impacted by the just transition and the effects of climate change are involved in the NDCs development process.

Some of these policy recommendations are particularly integral to Article 9, Finance. They call for financial justice in the food system, with an emphasis on mobilising finance for the just transition whilst supporting and protecting local food systems through inclusive policies, addressing inequalities, and promoting regional food production. Policies looking at redirecting government subsidies and funding supporting large-scale industrial agriculture and unsustainable practices towards agroecology will unlock climate finance to support small-scale producers and marginalised groups.

These policy recommendations also support mitigation efforts (Article 4) by calling for more effective emission reduction against “false solutions” like carbon offset schemes, ending harmful practices and supporting carbon sequestration through agroecology. Policies strengthening reporting requirements for greenhouse gas emissions from the industrial food system, including Scope 3 emissions, are necessary to achieve transparency (Article 13) and mitigation efforts (Article 4).

## **Lever 2: Policies to shift towards agroecological practices**

Whilst for developing countries severely hit by climate change, shifting to agroecology might be an adaptation strategy to increase resilience and reduce vulnerabilities (Article 7), for economically developed countries that heavily rely on the industrial animal agriculture sector, shifting to agroecology must be the priority, as a mitigation strategy (Article 4).

Policies under this lever aim at increasing financial support for farmers and fisherfolks to transition to sustainable, agroecological practices and align with Article 13, Transparency, by integrating environmental metrics into food policies.

These policies promote equity, adaptation and sustainable practices that are critical to meeting the broader objectives of the Paris Agreement, including limiting the impacts of climate change and supporting adaptation efforts in marginalised communities.

## **Lever 3: Policies enabling a shift towards diets within planetary and social boundaries**

This lever is primarily focused on Article 4 mitigation. For high-consuming countries, putting policies in place that support the uptake of diets within social and planetary boundaries by decreasing the consumption of meat and dairy products is an untapped and necessary climate mitigation strategy, delivering health co-benefits.

For low-consuming countries, maintaining diets within social and planetary boundaries will be critical to protect land from industrial animal agriculture to upscale agroecology.

## **Achieving the Sustainable Development Goals**

The 2030 Agenda for Sustainable Development was adopted by all United Nations Member States in 2015. The Agenda is centred around 17 Sustainable Development Goals (SDGs), which provide a blueprint that recognizes the interconnections between global challenges such as poverty, health, inequality, economic growth and the urgent need to address the climate emergency and protect nature. A just transition away from industrial animal agriculture requires a system-based approach that, by definition, avoids tradeoffs and instead reinforces synergies, allowing us to meet multiple SDGs.

The recent United Nations Sustainable Development Goals Report 2024<sup>22</sup> paints a grim picture of the progress made to achieve the SDGs by 2030 with only 17% of the SDG targets being on track, nearly half showing minimal or moderate progress, and over one third stalled or even regressed compared to the 2015 baseline.

The Just Transition away from the industrial animal agriculture model is an opportunity to accelerate progress. The levers identified by the just transition white paper can be directly tied to 15 out of the 17 SDGs. With the food system's role in determining food security, shaping public health, providing livelihoods for billions of people, and defining how we interact with the environment, these levers are not merely aligned with the SDGs, but are crucial to achieving them.

## **Level 1: Policies to strengthen food system governance**

Strengthening food system governance is necessary to advance nearly every SDG. Policies to prioritise public interest and protect against corporate influence ensure justice and fairness in trade and investment, supporting SDG 16 (Peace, Justice and Strong institutions). These policies also require strong worker protections, dignity and a livable income for farmers, farmworkers and food chain workers, contributing to SDG 1 (No Poverty), SDG 8 (Decent Work and Economic Growth), SDG 10 (Reduced Inequalities), and SDG 11 (Sustainable Cities and Communities). Shifting subsidies from industrial animal production to women and marginalised producers, as well as increasing support for these producers and implementing participatory decision-making, further promotes these SDGs in addition to advancing SDG 5 (Gender Equality).

Holding multinational agribusiness corporations responsible for the harms they cause is essential to reducing greenhouse gas emissions, preventing air and water pollution, and ending deforestation to protect the health of communities and ecosystems as required by SDG 3 (Good Health and Well-Being), SDG 6 (Clean Water and Sanitation), SDG 11 (Sustainable Cities and Communities), SDG 13 (Climate Action), SDG 14 (Life Below Water), and SDG 15 (Life on Land).

By promoting fair trade, sustainable agricultural practices and equitable access to nutritious food, just transition policies contribute to SDG 1 (No Poverty), SDG 2 (Zero Hunger) and SDG 3 (Good Health and Well-Being). These policies also reduce food waste in line with SDG 12 (Responsible Consumption and Production) and support small-scale farmers leading to economic growth (SDG 8) and reduced inequality (SDG 10).

**Finally, implementing policies to enable a just transition will require strong collaborative efforts at the international, regional and national levels between nations, international organisations, regulatory bodies, investors, corporations, civil society organisations, unions and local communities, which are needed to advance SDG 17 (Partnerships for the Goals).**

## **Level 2: Policies to shift towards agroecological practices**

Agroecology is a holistic way of producing food that prioritises the well-being of people and the planet. Policies supporting the implementation and scale-up of agroecology are a key component of most of the 17 SDGs.

In addition to advancing the SDGs identified under strengthening food system governance by providing the pathway to equitable, humane and sustainable food systems, policies that accelerate the shift to agroecological practices also contribute to SDG 4 (Quality Education) by increasing access to research, technical assistance, skill-building and knowledge-sharing among small-scale, Indigenous and traditional producers.

## **Level 3: Policies enabling a shift towards diets within planetary and social boundaries**

Shifting towards diets within planetary and social boundaries is a necessary step in improving agricultural practices and ending industrial animal production's exploitation of people, animals and the planet, therefore removing the barriers to achieving the SDGs identified in the previous levers. Dietary shifts ease demands on the environment, making it possible to employ more sustainable farming practices and building a more resilient food system to end hunger and food waste.



High-consuming countries rely on resource-intensive, industrially produced animal products that are linked to diet-related diseases. Policies promoting plant-centred diets will play a pivotal role in advancing both health-related and environmental SDGs. Plant-centred diets promote health and food security, which is necessary to achieve SDG 3 (Good Health and Well-Being), SDG 2 (Zero Hunger) and SDG 10 (Reduced Inequality) by increasing access and the availability of sustainable and nutritious food for all. Policies to increase access to and adoption of plant-rich diets also contribute to SDG 4 (Quality Education) by closing the education gaps for healthcare professionals, consumers and the public and by increasing understanding of the connection between nutrition, food choices and environmental sustainability.

Reduced meat consumption and increased plant-based food consumption are core to SDG 16 (Responsible Consumption and Production) and will mitigate environmental degradation, conserve water resources, and protect biodiversity, contributing to SDG 13 (Climate Action), SDG 14 (Life Below Water), and SDG 15 (Life on Land). Such policies will foster sustainable agriculture and support economic growth (SDG 8), ultimately bringing about a more equitable and sustainable world.

## **Honouring the Global Methane Pledge**

The Global Methane Pledge commits countries to collectively reduce global methane emissions across all sectors by at least 30% below 2020 levels by 2030. This includes methane emissions from agriculture. Of the 150 countries<sup>23</sup> that have adopted the methane pledge, more than 50 have developed national methane action plans or are in the process of doing so.

Methane is a short-lived climate pollutant with more than 80 times the global warming potential of CO<sub>2</sub> over a 20-year period, which makes rapidly reducing methane a powerful way to meet emissions-reduction targets and avoid the worst impacts of catastrophic climate change.

Industrial animal agriculture causes 32% of global anthropogenic methane emissions, more than natural gas, oil or coal production<sup>24</sup>. This makes it essential to reduce industrial livestock to reach the targets of both the Global Methane Pledge and the Paris Agreement<sup>25</sup>. Methane emissions may be underestimated by as much as 39% to 90% in areas with highly intensified confined feeding operations, which further undermines these models as a sustainable development solution<sup>26</sup>.

Regarding agriculture specifically, countries have committed to taking comprehensive domestic action to achieve the target, through technological innovation, incentives and partnerships with farmers. Since the majority of agricultural methane comes from the natural digestion processes of livestock, it is only possible to meet these targets through a just transition from industrial animal production towards agroecological systems and shifting towards plant-rich diets in high-consuming countries. The policy recommendations laid out in the white paper provide pathways to achieve the broad goal of the pledge.

### **Lever 1: Policies to strengthen food system governance**

The global methane pledge welcomes actions or incentives put forward by the private sector, development banks, financial institutions and philanthropists to support global methane reductions. Any such actions or incentives must ensure that methane-reduction targets are part of any funding granted. Given the sector's high methane emissions, the pledge can only be met if no funding is granted to industrial farming entities.

It also explicitly mentions the need to improve transparency and complete, accurate methane emissions data that can only be achieved through stronger governance.

## **Lever 2: Policies to shift to agroecological practices**

The global methane pledge calls for incentives for and partnerships with farmers to reduce methane in their sector. Support should facilitate the transformation of systems through methane-reduction action plans. These must include access to finance, incentives, training, guarantees and support for a just transition in order to achieve the necessary methane reductions.

## **Lever 3: Policies enabling a shift towards diets within planetary and social boundaries**

Methane emission reduction action plans envisaged under the global methane pledge will only effectively reduce agricultural emissions if they encourage a shift to plant-based diets alongside mitigation efforts. Incentives should be put in place to move farmers from high-methane livestock production to high-protein crops, while implementing production practices focused on increasing efficiency. This should include restrictions on the marketing of high-methane dairy and meat and ending government-supported promotions of animal proteins. National dietary guidelines should reflect this.

## **Reaching the goals and targets of the Kunming-Montreal Global Biodiversity Framework**

One million wild plant and animal species will face extinction in the coming decades unless action is taken to address the key drivers of biodiversity loss<sup>27</sup>. The 2024 Living Planet Report found that



wildlife populations have plummeted by an alarming average of 73% since 1970, with declines as steep as 95% in Latin America and the Caribbean<sup>28</sup>. The report identifies habitat loss and degradation driven by the global food system as the greatest threat to biodiversity across all regions. For the past 50 years, agricultural expansion — largely for feed crops and grazing — has been the leading cause of land-use change<sup>29</sup>.

According to a landmark report supported by the United Nations, agriculture is a primary source of biodiversity loss and threatens 86% of species at risk of extinction<sup>30</sup>. Industrial animal agriculture, fishing and aquaculture are responsible for a disproportionate contribution to the extinction crisis. In addition to habitat destruction and degradation (including loss of forests, grasslands and ocean ecosystems), they are leading drivers of air and water pollution, drought, climate change, overfishing and direct threats to keystone species<sup>31</sup>. Industrial animal agriculture facilities also provide opportunities for the mutation and evolution of zoonotic diseases as well as spurring outbreaks of known pathogens that can spill over into wildlife and other animals, including people, with deadly consequences. Highly pathogenic avian influenza is an example and has led to the culling of millions of birds and put the future of already imperilled wild species, including the California condor, at risk<sup>32,33</sup>. Furthermore, avian influenza H5N1 has infected a wide variety of other mammal species, including endangered tigers and marine mammals, which heightens the impact it is having on biodiversity.

The Kunming-Montreal Global Biodiversity Framework was adopted at the 15<sup>th</sup> Conference of the Parties to the Convention on Biological Diversity (CBD COP15) in 2022. The mission of the framework includes “halt[ing] and revers[ing] biodiversity loss to put nature on a path to recovery for the benefit of people and the planet”. It sets four goals to achieve by 2050 and identifies 23 targets for urgent action by 2030.



The framework emphasises just transition principles in several places, including the need for fairness and equity, a human rights-based approach, and the empowerment of women and girls as well as centering the role of Indigenous Peoples in meeting the targets. It also mentions the value of nature and the links between biodiversity and health, calling for holistic approaches such as One Health in implementation. To achieve the vision, goals and targets of the framework, a just transition away from industrial animal production toward equitable, humane and sustainable food systems is necessary.

As summarised below, the recommended levers in the Just Transition white paper would contribute positively toward attaining nearly every framework target.

## **Lever 1: Policies to strengthen food system governance**

Shifting power from multinational corporations to inclusive, democratic, community-based models will help meet Target 1's focus on participatory planning that respects the rights of Indigenous peoples and local communities, particularly taking into account industrial animal production's disproportionate role in land and sea use change. These local decision making processes can similarly help meet capacity building and equitable sharing benefits in Target 13, knowledge sharing and participatory management of biodiversity in Target 21, inclusive and gender-responsive participation in Target 22, and gender equity in implementation in Target 23.

The just transition's holistic approach to governance is rooted in fairness and equity, but also requires that workers, communities, environmental health, animal welfare, and biodiversity are prioritised over corporate profits. This approach is necessary to achieve Target 14 to ensure the integration of biodiversity in policies and practices across all levels of government.

The essential goals of restoring and protecting 30% of the planet by 2030 reflected in Targets 2 and 3 can only be achieved if industrial agriculture operations are held accountable for their pollution and the expansion of industrial animal agriculture is stopped. Furthermore, recognising the rights of Indigenous and local communities is a key part of achieving a just transition through working with Indigenous farmers, smallholder farmers, peasants, pastoralists, small-scale fishers, and frontline communities.

Stronger regulation and enforcement of food system policies to regulate industrial fisheries will help meet Target 5 by preventing overexploitation and minimising bycatch. The industrial animal agriculture industry has not been held accountable for its role in the climate emergency, thus Target 8 can only be achieved by holding the sector responsible for fully accounting and setting targets for the reduction of agricultural emissions, particularly from cattle-driven methane emissions. In order to meet Target 11, a primary source of air, water and soil pollution as well as agricultural emissions, desertification, threats to pollinators, and disease risk must be addressed by phasing out industrial animal production. This would also have a co-benefit on Target 5 by reducing the risk of pathogen spillover. Reducing the high biosecurity risks of concentrated animal feeding operations is similarly necessary to ensure biosafety measures in Target 17. Increasing monitoring, transparency and compliance for multinational agribusiness corporations will be critical for Target 15 because of the sector's significant impact on biodiversity and consumption patterns.

Finally, financial reform is an important aspect of strengthening food system governance. Industrial animal agriculture is propped up by an enormous amount of subsidies and incentives, and shifting financing away from the sector's harmful practices in a just transition is necessary to achieve Target 18.

## **Lever 2: Policies to shift towards agroecological practices**

Target 10 is the only place where the framework specifically mentions sustainable agriculture,

aquaculture and fisheries, including agroecology as a biodiversity-friendly practice, even though it's evident that food-system impacts and solutions are intertwined with the success of nearly every target. It's important to note that although Target 10 also advocates for increasing "sustainable intensification," that concept is antithetical to a just food system. Industrial production systems inherently increase the risk of diseases, exploitation of workers and animals, and concentrated pollution, particularly for the marginalised communities where these operations are located, and continuing to support these production systems will impede the ability to meet the majority of targets.

Agroecology is defined as "work[ing] together with nature and not against it, cherishing synergies between living beings and prioritising traditional farmer knowledge and participatory, transgenerational, and experiential learning processes"<sup>34</sup>. As such, a just transition towards agroecological practices is a key part of minimising human-wildlife conflicts in Target 4, reducing pollution risks in Target 7, including those from pesticides, and the importance of protecting traditional use of wildlife by Indigenous peoples and local communities, such as small-scale fishers, in Target 9. A just transition towards agroecology further advances Target 7 by centering food security and livelihoods.

Policies to advance agroecological production is also necessary for Target 6, as grazing livestock are a significant source of invasive species introduction and spread. Shifting from industrial livestock operations toward agroecology and supporting small and medium-size enterprises will reduce the opportunity for livestock to spread invasive species.

Finally, supporting agroecological production that works in harmony with nature will help meet Target 19 to substantially increase financing for biodiversity. Specifically, it provides a pathway for investing in innovative schemes. Some of the examples named in the framework, such as biodiversity offsets and credits, are problematic since these types of schemes typically benefit only the largest producers at the expense of environmental justice communities and sensitive habitats. However, investing in programs such as land-sharing that can reduce agricultural impacts on vital habitats and in restoring and rewilding farmland and pastureland as producers shift toward less land-intensive practices can help meet this target without undermining other targets and goals of the framework.

### **Lever 3: Policies enabling a shift towards diets within planetary and social boundaries**

Both the framework and the just transition recognise the importance of shifting consumption in reducing the global impact of industrial production. Accelerating dietary shifts, particularly in countries with high consumption of meat, dairy and seafood, requires supporting policy, education, and access to sustainable alternatives. These steps are necessary to meet Target 16's focus on increasing access to sustainable consumption choices and significantly reducing overconsumption.

The only way to achieve the food system transformation that's necessary to ease pressure on nature and allow biodiversity to recover and thrive is by addressing both production and consumption of industrially-produced animal products while increasing adoption of agroecological practices and plant-rich diets.

# References

Center for Biological Diversity, World Animal Protection, et al. 2024. Just Transition from Industrial Livestock Production to an Equitable, Humane, and Sustainable Food Systems. Available in English, French, Spanish, and Portuguese at [www.JustFoodTransitionRoadmap.com](http://www.JustFoodTransitionRoadmap.com).

<sup>2</sup> FAO. 2022. GLEAM v3 Dashboard. In: Shiny Apps. [https://foodandagricultureorganization.shinyapps.io/GLEAMV3\\_Public/](https://foodandagricultureorganization.shinyapps.io/GLEAMV3_Public/)

<sup>3</sup> Xu, X., Sharma, P., Shu, S., Lin, T. S., Ciaï, P., Tubiello, F. N., ... & Jain, A. K. 2021. Global greenhouse gas emissions from animal-based foods are twice those of plant-based foods. *Nature Food*, 2(9), 724-732. <https://doi.org/10.1038/s43016-021-00358-x>

<sup>4</sup> Emissions impossible: How big meat and dairy are heating up the planet. 2018. GRAIN and the Institute for Agriculture and Trade Policy (IATP). <https://www.iatp.org/emissions-impossible>

<sup>5</sup> Emissions impossible: How big meat and dairy are heating up the planet. 2018. GRAIN and the Institute for Agriculture and Trade Policy (IATP). <https://www.iatp.org/emissions-impossible>

<sup>6</sup> Scope 3 emissions are the result of activities from assets not owned or controlled by the reporting organisation, but that the organisation indirectly affects in its value chain. Scope 3 emissions include all sources not within an organisation's scope 1 and 2 boundary. The scope 3 emissions for one organisation are the scope 1 and 2 emissions of another organisation. Scope 3 emissions, also referred to as value chain emissions, often represent the majority of an organisation's total greenhouse gas (GHG) emissions.

World Resources Institute & World Business Council for Sustainable Development, 2013. Technical Guidance for Calculating Scope 3 Emissions Supplement to the Corporate Value Chain (Scope 3) Accounting & Reporting Standard. [https://ghgprotocol.org/sites/default/files/standards/Scope3\\_Calculation\\_Guidance\\_0.pdf](https://ghgprotocol.org/sites/default/files/standards/Scope3_Calculation_Guidance_0.pdf)

<sup>7</sup> FAIRR. Sustainable Aquaculture Engagement. <https://www.fairr.org/engagements/sustainable-aquaculture> (Accessed 29 June 2023)

<sup>8</sup> Jägermeyr, J., Müller, C., Ruane, A. C., Elliott, J., Balkovic, J., Castillo, O., ... & Rosenzweig, C. (2021). Climate impacts on global agriculture emerge earlier in new generation of climate and crop models. *Nature Food*, 2(11), 873-885.

<sup>9</sup> IPCC, 2023: Sections. In: *Climate Change 2023: Synthesis Report. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change* [Core Writing Team, H. Lee and J. Romero (eds.)]. IPCC, Geneva, Switzerland, pp. 35-115, doi: 10.59327/IPCC/AR6-9789291691647.

<sup>10</sup> Myers SS, Zanolletti A, Kloog I, Huybers P, Leakey ADB, Bloom AJ, Carlisle E, Dietterich LH, Fitzgerald G, Hasegawa T, Holbrook NM, Nelson RL, Ottman MJ, Raboy V, Sakai H, Sartor KA, Schwartz J, Seneweera S, Tausz M, Usui Y. (2019). *Nature*. 2019 Oct;574(7778):E14. doi: 10.1038/s41586-019-1602-8.

<sup>11</sup> Thornton, P., Nelson, G., Mayberry, D., & Herrero, M. (2022). Impacts of heat stress on global cattle production during the 21st century: a modelling study. *The Lancet Planetary Health*, 6(3), e192-e201. doi:[https://doi.org/10.1016/S2542-5196\(22\)00002-X](https://doi.org/10.1016/S2542-5196(22)00002-X)

<sup>12</sup> Cheng, M., McCarl, B., & Fei, C. 2022. Climate Change and Livestock Production: A Literature Review. *Atmosphere* 2022, Vol. 13, Page 140, 13(1), 140. <https://doi.org/10.3390/ATMOS13010140>

<sup>13</sup> Thornton, P. K. 2010. Livestock production: Recent trends, future prospects. In *Philosophical Transactions of the Royal Society B: Biological Sciences* (Vol. 365, Issue 1554, pp. 2853–2867). Royal Society. doi: <https://doi.org/10.1098/rstb.2010.0134>

<sup>4</sup> COP28 UAE Declaration on Sustainable Agriculture, Resilient Food Systems, and Climate Action <https://www.cop28.com/en/food-and-agriculture> (accessed 8 october 2024)

<sup>5</sup> <https://unfccc.int/cop28/outcomes>

<sup>6</sup> UNFCCC. Decision -/CMA.5 Outcome of the first global stocktake [https://unfccc.int/sites/default/files/resource/cma5\\_auv\\_4\\_gst.pdf](https://unfccc.int/sites/default/files/resource/cma5_auv_4_gst.pdf)

<sup>7</sup> UNFCCC, 2023: United Nations Framework Convention On Climate Change. United Nations, FCCC/PA/CMA/2023/16/Add.1, Secretariat of the United Nations Framework Convention on Climate Change, [https://unfccc.int/sites/default/files/resource/cma2023\\_16a01E.pdf](https://unfccc.int/sites/default/files/resource/cma2023_16a01E.pdf)

<sup>8</sup> Clark, M. A., N. G. G. Domingo, K. Colgan, et al. 2020. Global food system emissions could preclude achieving the 1.5° and 2°C climate change targets. *Science* 370(6517), 705–708. doi: 10.1126/science.aba7357

<sup>9</sup> Harwatt, H. Hayek, M.N. Behrens, P. and Ripple, W.J. (2024) Options for a Paris compliant livestock sector. Timeframes, targets and trajectories for livestock sector emissions from a survey of climate scientists. Research report, Brooks McCormick Jr. Animal Law & Policy Program, Harvard Law School. March 2024. Available at: <https://animal.law.harvard.edu/wp-content/uploads/Paris-compliant-livestock-report.pdf>

<sup>20</sup> 2020 EDITION POCKET GUIDE TO NDC, European Capacity Building Initiative (ecbi), <https://unepccc.org/wp-content/uploads/2020/06/2020-pocket-guide-to-ndcs.pdf>

- <sup>21</sup>Legal Response International. 2012. Common but differentiated responsibilities and respective capabilities (CBDRRC) , <https://legalresponse.org/legaladvice/the-principle-of-common-but-differentiated-responsibilities-and-respective-capabilities-a-brief-summary/>
- <sup>22</sup>United Nations. Sustainable Development Goals Report 2024. <https://unstats.un.org/sdgs/report/2024/The-Sustainable-Development-Goals-Report-2024.pdf>
- <sup>23</sup> <https://www.globalmethanepledge.org/#about>
- <sup>24</sup>United Nations Environment Programme and Climate and Clean Air Coalition. 2021. Global Methane Assessment: Benefits and Costs of Mitigating Methane Emissions. Nairobi. [ccacoalition.org/sites/default/files/resources//2021\\_Global-Methane\\_Assessment\\_full\\_0.pdf](http://ccacoalition.org/sites/default/files/resources//2021_Global-Methane_Assessment_full_0.pdf)
- <sup>25</sup>Forster, P. et al., 2021: The Earth's Energy Budget, Climate Feedbacks, and Climate Sensitivity. In *Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*, doi:10.1017/9781009157896.009 at Table 7.15
- <sup>26</sup>Hayek, M. N., & Miller, S. M. 2021. Underestimates of methane from intensively raised animals could undermine goals of sustainable development. *Environmental Research Letters*, 16(6), 063006.
- <sup>27</sup>IPBES. 2019. Global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. E.S. Brondizio, J. Settele, S. Diaz, and H.T. Ngo (editors). IPBES secretariat, Bonn, Germany. 1148 pages. doi: <http://doi.org/10.5281/zenodo.3831673>
- <sup>28</sup>WWF (2024) Living Planet Report 2024 – A System in Peril. WWF, Gland, Switzerland.
- <sup>29</sup>Winkler, K., Fuchs, R., Rounsevell, M. et al. Global land use changes are four times greater than previously estimated. *Nat Commun* 12, 2501. 2021. doi: <https://doi.org/10.1038/s41467-021-22702-2>
- <sup>30</sup>Benton, T. G., Bieg, C., Harwatt, H., Pudasaini, R., & Wellesley, L. 2021. Food system impacts on biodiversity loss. Three levers for food system transformation in support of nature. Chatham House, London. 2021-02-03-food-system-biodiversity-loss-benton-et-al.pdf ([chathamhouse.org](http://chathamhouse.org))
- <sup>31</sup>De Schutter, O., Jacobs, N., Clément, C., & Ajena, F. (2019). Towards a Common Food Policy for the European Union: The Policy Reform and Realignment That Is Required to Build Sustainable Food Systems in Europe. IPES-Food. Adopted by the IPES-Food panel in February 2019. [CFP\\_FullReport.pdf](http://ipes-food.org) ([ipes-food.org](http://ipes-food.org))
- <sup>32</sup>Linder A., Wilson McCarthy V., Green C., Nadzam B., Jamieson D., Stilt K. (2023). Animal Markets and Zoonotic Disease in the United States. e Brooks McCormick Jr. Animal Law & Policy Program at Harvard and the Center for Environmental and Animal Protection at New York University. <https://animal.law.harvard.edu/wp-content/uploads/Animal-Markets-and-Zoonotic-Disease-in-the-United-States.pdf>
- <sup>33</sup>Dazio, S. May 12, 2023. "California condors confront bird flu in flight from extinction". AP. <https://apnews.com/article/california-condors-avian-bird-flu-875b1ed89ce668b757af5bcc5bd4feaf>
- <sup>34</sup>EUROPEAN COORDINATION VIA CAMPESINA. Peasant Agroecology according to ECV. [https://www.eurovia.org/wp-content/uploads/2022/04/Agroecology\\_EN.pdf](https://www.eurovia.org/wp-content/uploads/2022/04/Agroecology_EN.pdf) (Accessed 24 August 2023)

