



Reflections on Flourishing within Limits: Jonas and Cafaro on Responsibility, Biomass, and Circular Justice

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Abstract

The growing reliance on biomass within European climate and circular economy strategies calls not only for technical evaluation but also for sustained philosophical reflection. This paper offers a normative inquiry into biomass utilization through the lens of flourishing within limits, situating renewable energy works within broader ethical debates on responsibility, intergenerational justice, and human well-being in the Anthropocene.

Drawing on Hans Jonas's ethics of responsibility, the paper argues that biomass deployment must be guided by a forward-looking moral imperative attentive to long-term ecological consequences and the vulnerability of future generations. Jonas's insistence on preserving the conditions for the continuity of life supports a precautionary and restrained approach to biomass development, particularly in ecologically sensitive and politically transitional contexts.

In dialogue with Jonas, the paper engages Philip Cafaro's environmental virtue ethics, emphasizing the moral character and practical dispositions required for genuinely sustainable energy choices. Virtues such as moderation, humility, and care challenge the growth-oriented rationalities embedded in some biomass policies and articulate an alternative vision of human flourishing grounded in ecological limits.

By bringing responsibility ethics and virtue ethics into conversation, the paper contends that a just circular economy must extend beyond material efficiency to include ethical self-limitation, relational accountability, and respect for planetary boundaries. It thus advances a philosophical foundation for circular justice, one that embeds biomass strategies within a normative framework of responsibility, restraint, and shared flourishing.

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Introduction

The accelerating climate crisis has intensified the global search for alternatives to fossil fuels, positioning renewable energy at the core of contemporary sustainability strategies. Within this context, biomass has emerged as a prominent component of European climate and circular economy policies, particularly under the European Green Deal and related decarbonization frameworks. While biomass is frequently presented as a technically viable and economically flexible renewable resource, its rapid expansion raises ethical and social questions that extend beyond carbon accounting and efficiency metrics. As a result, sustainability debates risk becoming overly technocratic, overlooking the normative foundations that should guide long-term ecological transitions.

This article responds to that gap by advancing a philosophical inquiry into biomass utilization, arguing that energy transitions cannot be ethically justified on technical grounds alone. Instead, they require a normative framework capable of addressing responsibility toward future generations, ecological integrity, and the conditions for human flourishing within planetary limits. To this end, the article draws on two complementary ethical traditions: Hans Jonas's ethics of responsibility and environmental virtue ethics, with particular emphasis on the work of Philip Cafaro [1,2].

The first section of the article examines Jonas's imperative of responsibility, which foregrounds foresight, precaution, and moral accountability in the face of technological power. Jonas argues that modern societies bear an ethical obligation to preserve the conditions for the continuation of life, especially under circumstances of uncertainty and irreversible ecological risk [1]. Applied to biomass, this perspective supports a cautious approach that prioritizes long-term ecological resilience and intergenerational justice, particularly in ecologically sensitive and politically transitional regions.

The second section turns to environmental virtue ethics, exploring how moral character and practical wisdom shape sustainable practices at both individual and collective levels. Drawing on Cafaro's critique of consumerism and growth-oriented environmental policies, the article highlights virtues such as moderation, humility, and care as essential dispositions for navigating ecological limits [2]. From this standpoint, biomass strategies should not merely substitute fossil fuels but should also challenge underlying assumptions about unlimited growth and resource exploitation.

Building on these ethical foundations, the third section addresses questions of governance, human rights, and democratic participation in biomass decision-making. Ethical responsibility, the article argues, must be institutionally embedded through inclusive procedures, transparency, and equitable distribution of environmental benefits and burdens. This dimension is particularly relevant for eco-agricultural systems and rural communities, where biomass production often intersects with land use, food security, and social vulnerability.

Finally, the article introduces the concept of circular justice as an integrative normative framework that connects responsibility ethics, virtue ethics, and democratic governance. Circular justice extends prevailing models of the circular economy by emphasizing ethical self-limitation, relational accountability, and respect for planetary boundaries alongside material efficiency. In doing so, it offers a philosophical basis for evaluating biomass policies not only in terms of sustainability outcomes, but also in relation to social fairness and human flourishing within limits.

By combining ethical theory with political and ecological critique, this article contributes to interdisciplinary debates in geoscience, eco-agriculture, and sustainability studies. It argues that a genuinely sustainable energy transition requires not only renewable technologies, but also ethical frameworks capable of guiding responsible action in the Anthropocene.

Literature Review

Contemporary debates on sustainability increasingly recognize that ecological crises cannot be addressed through technological innovation alone. A growing body of philosophical literature argues that environmental challenges—including the expanded use of biomass—require ethical frameworks capable of addressing long-term consequences, moral responsibility, and the conditions for human flourishing within ecological limits. Among these contributions, Hans Jonas's ethics of responsibility and Philip Cafaro's environmental virtue ethics offer particularly influential and complementary perspectives.

Hans Jonas's seminal work, *The Imperative of Responsibility* (1984), marks a decisive shift in modern moral philosophy by confronting the ethical implications of technological power. Jonas argues that traditional ethical systems, oriented toward proximate actions and immediate consequences, are inadequate in an age where human interventions have irreversible and global ecological effects. Central to his argument is the asymmetry between the unprecedented power humans now possess and the insufficient sense of responsibility accompanying it [1]. From this standpoint, sustainability is not merely a policy objective, but a moral obligation grounded in the duty to preserve the conditions for the continuity of life. Jonas's emphasis on foresight, precaution, and intergenerational justice has made his work foundational in bioethics and environmental ethics, particularly in discussions concerning energy systems, ecological risk, and long-term environmental governance.

Recent scholarship has further developed Jonas's ethics of responsibility in relation to sustainability and intergenerational justice, highlighting its relevance for contemporary environmental governance and normative limits to technological power [3].

While Jonas provides a responsibility-based ethics focused on consequences and future-oriented obligation, environmental virtue ethics shifts attention toward moral character and practical wisdom. Philip Cafaro has been a central figure in developing this approach, beginning with his early articulation of environmental virtue ethics in "Thoreau, Leopold

and Carson: Toward an Environmental Virtue Ethics" (2001). In this work, Cafaro argues that sustainable living depends not only on rules or outcomes but on cultivating virtues such as simplicity, attentiveness, and respect for nature. This perspective challenges dominant utilitarian and technocratic approaches by emphasizing the moral dispositions that guide everyday environmental decision-making.

Cafaro's critique of unsustainable behavior is further developed in "Gluttony, Arrogance, Greed, and Apathy" (2005), where he identifies key environmental vices underpinning ecological degradation. Rather than attributing environmental harm solely to systemic failures, Cafaro highlights the role of moral character in perpetuating overconsumption and ecological indifference. In collaboration with Gambrel, "The Virtue of Simplicity" [4] advances this argument by reframing ecological restraint not as sacrifice, but as a pathway to a richer conception of the good life. This insight is particularly relevant to biomass policies, which are often justified through efficiency gains without questioning underlying consumption patterns.

Cafaro later extends environmental virtue ethics into the civic and political domain. In *Environmental Virtue Ethics* (2015) and in his essays on patriotism as an environmental virtue [5], he argues that ethical citizenship entails responsibility toward shared natural heritage and future generations. Here, environmental stewardship becomes a civic duty, linking personal virtue to democratic participation and public policy. This civic orientation is reinforced through his work on environmental education (Martin, Cafaro, & Reeson, 2008, 2009), which explores how ecological virtues can be cultivated through experiential learning and place-based engagement, particularly among younger generations.

Underlying Cafaro's ethical project is a strong engagement with Thoreauvian naturalism. In essays such as "Thoreau's Environmental Ethics in Walden" (2002) and "In Wildness Is the Preservation of the World" (2012), Cafaro interprets wildness, solitude, and simplicity as moral ideals rather than merely aesthetic preferences. These influences, combined with Aristotelian virtue ethics and democratic theory, allow Cafaro to articulate a comprehensive framework for evaluating sustainability choices, including land

use, energy systems, and biomass governance.

This body of work intersects with broader philosophical critiques of techno-optimism and growth-centered sustainability. Hamilton (2017) challenges dominant narratives of the Anthropocene that celebrate human mastery over nature, arguing instead for ethical humility and restraint in the face of ecological uncertainty [6]. Similarly, Latouche (2009) advances the degrowth paradigm, emphasizing that well-being cannot be equated with material throughput and that ecological sustainability requires a cultural and moral transformation [7]. These critiques reinforce the ethical concerns raised by Jonas and Cafaro, particularly regarding the risks of framing biomass as a limitless or inherently benign solution.

Taken together, this literature converges on a value-driven understanding of sustainability that transcends technical fixes and policy instruments. It suggests that addressing ecological challenges such as biomass overuse requires an ethical transformation encompassing responsibility, virtue, and civic engagement. By situating biomass within this philosophical landscape, the present study builds upon and integrates these insights to develop a normative foundation for circular justice, grounded in restraint, intergenerational responsibility, and flourishing within ecological limits.

Theoretical Framework: Circular Justice and Flourishing Within Limits

This article advances circular justice as a normative framework that integrates responsibility ethics, environmental virtue ethics, and sustainability governance. Circular justice extends prevailing models of the circular economy by shifting the focus from material efficiency alone toward ethical self-limitation, intergenerational responsibility, and social fairness. While circular economy strategies typically emphasize recycling, resource optimization, and technological innovation, they often under-theorize the moral and political values required to sustain such systems over time.

The concept of circular justice also draws on recent work that connects Jonas's ethics of responsibility with broader debates on sustainability, virtue, and intergenerational justice, emphasizing ethical limits as a condition for long-term human flourishing [3].

At its core, circular justice is grounded in Hans Jonas's ethics of responsibility, which demands that societies exercise restraint in proportion to their technological power [1]. Applied to biomass, this perspective highlights the moral obligation to consider long-term ecological impacts, land-use conflicts, and cumulative environmental risks. Circular justice thus rejects the assumption that renewable resources are inherently benign, insisting instead on precaution, foresight, and accountability toward future generations.

At the same time, circular justice draws on Philip Cafaro's environmental virtue ethics, which emphasizes that sustainability depends on the moral dispositions of individuals and communities [2,4]. From this viewpoint, circular systems cannot function solely through regulatory mechanisms or market incentives; they require virtues such as moderation, humility, and care to guide production, consumption, and governance practices. In the context of biomass, this implies questioning growth-oriented energy policies and recognizing that genuine sustainability may require consuming less, not merely consuming differently.

Circular justice further incorporates procedural and distributive dimensions of justice, linking ethical responsibility to democratic participation and human rights. Biomass production often affects rural landscapes, agricultural systems, and local communities, raising questions about land access, food security, and environmental burden-sharing. Circular justice therefore emphasizes inclusive decision-making, transparency, and equitable distribution of both benefits and risks, ensuring that sustainability transitions do not reproduce social or ecological inequalities.

By integrating responsibility, virtue, and justice, circular justice provides a framework for understanding sustainability as an ethical practice rather than a purely technical solution. It articulates a vision of flourishing within limits, where human well-being is pursued in harmony with ecological boundaries and social obligations. In this sense, circular justice reframes biomass not as a limitless renewable input, but as a morally constrained resource whose use must be guided by restraint, care, and collective responsibility.

This framework offers a philosophical foundation for evaluating biomass policies in the Anthropocene, contributing to interdisciplinary debates in geoscience,

eco-agriculture, and environmental governance. It underscores that the success of circular economy strategies ultimately depends on cultivating ethical orientations capable of sustaining both ecological systems and human communities over time.

Key Case for Hans Jonas and Philip Cafaro

Hans Jonas (1903–1993) was a German-born Jewish philosopher whose intellectual formation was shaped by his studies under Edmund Husserl and Martin Heidegger. His early work in philosophical biology, combined with his lived experience as a Holocaust survivor and émigré, profoundly influenced his ethical thought. Jonas approached philosophy with a distinctive sense of existential urgency, insisting that ethical reflection must respond to the unprecedented powers unleashed by modern science and technology. This concern culminated in his most influential work, *The Imperative of Responsibility* (1984), in which he argues that traditional moral frameworks are insufficient for an age in which human actions can irreversibly alter—or even extinguish—the conditions of life on Earth.

At the core of Jonas's philosophy lies a redefinition of moral responsibility as fundamentally future-oriented. He contends that ethical action must be guided by foresight, humility, and a precautionary attitude toward technological intervention, particularly where ecological systems and future generations are concerned. In this sense, responsibility is not limited to immediate consequences or contractual obligations but extends to the preservation of the very possibility of human and non-human life. Jonas's work has since become foundational in debates on environmental ethics, bioethics, and the governance of technological risk, offering a moral framework that directly challenges unrestrained innovation and growth-driven development. Philip Cafaro (b. 1966) is an American philosopher and professor of philosophy at Colorado State University, widely recognized for his contributions to environmental ethics and the development of environmental virtue ethics. Drawing on Aristotelian moral philosophy, Cafaro shifts ethical attention from rules and outcomes toward character, practical wisdom, and the cultivation of virtues appropriate to ecological living. His work responds to the moral deficiencies underlying contemporary environmental crises, particularly those linked to overconsumption and anthropocentric value systems.

In his influential essay “Gluttony, Arrogance, Greed, and Apathy” (2005), Cafaro identifies core environmental vices that drive ecological degradation and social injustice. Rather than framing sustainability as a matter of sacrifice or moral guilt, he argues that cultivating virtues such as simplicity, humility, and care enables a richer and more meaningful conception of the good life. Cafaro's ethical approach emphasizes the moral quality of human–nature relationships, highlighting how everyday practices and civic commitments shape ecological outcomes. Situated firmly within the tradition of environmental virtue ethics, his work complements responsibility-based approaches by underscoring the role of moral character and shared values in sustaining just and ecologically viable societies.

Together, Jonas and Cafaro offer distinct yet convergent philosophical resources for rethinking sustainability. While Jonas foregrounds responsibility in the face of technological power and long-term risk, Cafaro emphasizes virtue, restraint, and the ethical transformation of lifestyles and institutions. Their combined perspectives provide a robust ethical foundation for evaluating biomass policies and advancing a vision of flourishing within ecological limits.

Hans Jonas: Ethics of Responsibility in the Context of Biomass

Hans Jonas's imperative—“Act so that the effects of your action are compatible with the permanence of genuine human life on Earth” serves as the ethical cornerstone of his philosophy in the face of modern technological power [1]. Shaped profoundly by his experience as a Holocaust survivor and by the ecological consequences of industrial modernity, Jonas developed a moral framework animated by existential urgency. For him, the question of responsibility is no longer abstract or theoretical, but a matter of safeguarding life itself under conditions of unprecedented technological capacity.

In *The Imperative of Responsibility* (1984), Jonas argues that classical ethical systems were designed for a world in which human actions had limited reach, short temporal horizons, and primarily interpersonal consequences. Modern technologies, by contrast—ranging from nuclear energy and genetic engineering to large-scale ecological interventions—extend the scope, duration, and irreversibility of human action across

generations and entire ecosystems. As a result, traditional ethics proves inadequate. Jonas therefore calls for fundamentally new, forward-looking ethics, one that takes responsibility for the long-term viability of life on Earth as its central moral criterion.

Jonas's concept of responsibility is both ontological and moral. Ontologically, he affirms the intrinsic value of life, insisting that living beings deserve protection not merely for their utility to humans, but in virtue of their existence. Morally, this affirmation gives rise to a duty of restraint: the power to act technologically does not imply the moral right to do so without limit. His ethics is structured around the asymmetry between human power and the vulnerability of what can be harmed—a condition especially acute in ecological contexts, where damage may unfold slowly yet prove irreversible, as in cases of biodiversity loss, soil degradation, or ecosystem collapse.

Applied to biomass governance, Jonas's philosophy yields several critical insights. First, it challenges the assumption that biomass is inherently sustainable simply because it is classified as renewable. While biomass may reduce dependence on fossil fuels, its production and use can entail serious ecological risks, including deforestation, habitat loss, nutrient depletion, and competition with food systems. From a Jonas' perspective, energy strategies must be evaluated not only by short-term emissions reductions or economic efficiency, but by their compatibility with the long-term flourishing of the biosphere.

Second, Jonas's notion of heuristic fear plays a central role in ethical decision-making under uncertainty. Rather than treating uncertainty as a justification for inaction or technological optimism, Jonas argues that the possibility of catastrophic harm should guide moral restraint. In the context of emerging biomass technologies—such as bioengineered energy crops or carbon-intensive conversion processes—this principle supports precautionary governance. The absence of conclusive scientific proof of harm does not absolve responsibility; on the contrary, uncertainty itself becomes a moral reason for caution.

Building on Jonas's framework, recent interpretations emphasize that responsibility under uncertainty requires not only precautionary governance but also ethical self-limitation embedded in sustainability

discourse and institutional design [3].

Third, Jonas's ethics directly challenges anthropocentric instrumentalism, the view that nature has value only insofar as it serves human ends. His insistence on the intrinsic worth of non-human life aligns his philosophy with an ecocentric ethical orientation, according to which human flourishing is inseparable from the integrity of ecological systems. Biomass strategies that prioritize energy output at the expense of ecosystems, indigenous land rights, or future soil fertility violate this principle, even if they satisfy narrow sustainability metrics.

Jonas is also critical of the moral minimalism embedded in market-based governance systems. Efficiency calculations and cost-benefit analyses, while useful, are insufficient substitutes for ethical judgment. Decisions about scaling up biomass production should not be left solely to carbon accounting models or economic optimization algorithms. Instead, they must answer a deeper moral question: do these strategies preserve the conditions of life for those who cannot speak—the unborn, non-human species, and future generations?

Beyond *The Imperative of Responsibility*, Jonas's earlier reflections on Gnosticism and modern science further illuminate his ecological concerns. In *Philosophical Essays: From Ancient Creed to Technological Man* (1974), he critiques dualistic worldviews that detach humanity from nature, arguing that the scientific conquest of nature has come at the cost of metaphysical and existential disconnection. This insight enriches his later ethical work, underscoring that sustainability is not only a policy or moral issue, but also a spiritual and existential one.

In sum, Jonas's ethics of responsibility articulates a morally ambitious vision of sustainability grounded in humility, foresight, and care. His framework offers both a critique of biomass strategies that neglect long-term ecological risks and a positive guide for designing energy transitions under conditions of uncertainty. In the Anthropocene—marked by ecological tipping points and irreversible damage—Jonas's philosophy insists that ethical seriousness must precede technological enthusiasm, making his work indispensable for contemporary climate and biomass ethics.

While Hans Jonas grounds ecological responsibility in

the asymmetry between technological power and the vulnerability of life, his ethics leaves open the question of how such responsibility is embodied in everyday practices and social norms. Jonas articulates why limits are morally necessary in the face of risk, uncertainty, and irreversible harm, but says comparatively less about how individuals and communities learn to live well within those limits. It is precisely at this point that environmental virtue ethics, as developed by Philip Cafaro, extends and complements Jonas's framework. By shifting ethical attention from future-oriented obligation to present-oriented character and consumption practices, Cafaro translates the demand for limits into lived dispositions such as moderation, humility, and care. Together, Jonas and Cafaro offer a unified ethical vision in which responsibility sets the moral boundaries of action, while virtue shapes the habits and values through which flourishing within those boundaries becomes possible.

Philip Cafaro: Environmental Virtue Ethics and Biomass

Philip Cafaro, a leading philosopher in the field of environmental virtue ethics, has developed a comprehensive moral framework that combines Aristotelian ethics with ecological values. Educated in the American philosophical tradition and a professor at Colorado State University, Cafaro's work weaves together classical concepts of the good life, civic virtue, and ecological awareness. His writings reflect a deep commitment to transforming sustainability from a technical challenge into a moral and cultural project.

At the heart of Cafaro's philosophy is the conviction that modern ecological crises are driven by character flaws, by moral vices like gluttony, greed, arrogance, and apathy [2]. In contrast to rule-based or consequence-driven ethics, Cafaro emphasizes the importance of moral character and the cultivation of environmental virtues such as simplicity, humility, gratitude, and care. These virtues are not only personal attributes but cultural values that shape collective behavior. In essays such as *Economic Consumption, Pleasure and the Good Life* (2001) and *Less is More* (1998), he critiques consumerism as a moral pathology and proposes an alternative vision of flourishing, one grounded in moderation, meaningful work, and connection to nature.

His co-authored piece with Justin Gambrel, *The Virtue of Simplicity* (2010), further elaborates this position. Here, simplicity is not portrayed as sacrifice but as liberation—a conscious move away from material excess toward self-sufficiency and ecological mindfulness. “Living simply,” Cafaro writes, “can lead to a richer and more meaningful life, for ourselves and for others” [4]. This virtue, Cafaro argues, is essential for both individual well-being and environmental sustainability. By choosing a life of voluntary simplicity, individuals contribute to reducing ecological pressure and building more resilient communities.

A significant thread in Cafaro's thought is his engagement with Henry David Thoreau, whom he sees as a model of environmental virtue. In *Thoreau, Leopold, and Carson: Toward an Environmental Virtue Ethics* (2001), Cafaro presents Thoreau as a philosopher of moral ecology, someone who sought to live deliberately and in harmony with nature. Cafaro interprets Thoreau's solitude, resistance to consumerism, and reverence for wildness as practical expressions of virtue. In *Thoreau's Environmental Ethics in Walden* (2002), he emphasizes that Thoreau's ethical vision rested not only on love for nature, but on a disciplined and reflective character that resisted social pressures.

In *In Wildness is the Preservation of the World* (2012), Cafaro writes that “wildness encourages humility and respect, qualities too often missing in human dealings with the rest of the natural world” (Cafaro, 2012, p. 80). He argues that wildness should be protected not only for its biological value but for its moral and spiritual significance, as it nurtures humility and self-restraint in humans.

Cafaro has also explored the intersection of environmental ethics and civic identity. In *Thoreauvian Patriotism as an Environmental Virtue* (1995), *Patriotism as an Environmental Virtue* (2010), and his later contribution to the *Handbook of Patriotism* (2019), he argues that love of country must include a commitment to protecting the natural landscapes, ecosystems, and ecological future of one's homeland. “A good patriot,” he writes, “cares for the land and people of his country and works to protect them for future generations” [5].

This form of “green patriotism” contrasts with exploitative nationalism. It emphasizes place-based attachment and civic responsibility as core to sustainable

governance. It also aligns with democratic values, promoting environmental stewardship as a form of civic virtue.

Believing that virtues can be cultivated through education and experience, Cafaro has contributed to empirical studies on environmental moral development. In collaborative work with Martin, Bright, Mitteltaedt, and Bruyere (2008; 2009), he examines how experiential learning in nature can help adolescents develop ecological virtues. "Developing moral character," they write, "is a vital component of environmental education" (Martin et al., 2009, p. 345). These studies support his broader philosophical claim: environmental ethics must be embedded in education, not only as theory but as lived practice. Schools and communities must nurture the dispositions of care, attentiveness, and responsibility through direct engagement with the natural world.

When applied to biomass policies, Cafaro's virtue ethics offers a distinct lens that challenges both utilitarian cost-benefit thinking and technological reductionism. He would argue that it is not enough for biomass to be "renewable" or "efficient." We must ask: Does our approach to biomass reflect the virtues of humility and restraint, or the vices of greed and domination? For instance, large-scale biomass operations that displace local communities, degrade biodiversity, or intensify land pressures may violate the virtue-based principles that Cafaro promotes.

A virtue ethics approach would instead favor small-scale, community-managed, and ecologically informed biomass initiatives. These projects would be rooted in care for place, long-term thinking, and justice toward both humans and non-human life. Policy decisions would prioritize ethical reflection over market expediency, integrating questions of moral character into sustainability planning.

Moreover, Cafaro's work suggests that the success of biomass strategies depends on broader cultural change. If societies continue to valorise consumption, expansion, and growth, then even the most technically sound biomass policy will fall short. Only by embracing virtues such as simplicity, self-restraint, and reverence for nature can we create the moral foundations for sustainable energy systems.

Cafaro's environmental virtue ethics provides a holistic and humanistic framework for sustainability in the age of climate change. His call to cultivate character, honour ecological limits, and reimagine civic life offers both a critique of existing models and a constructive path forward. In the context of biomass, his insights remind us that ethical energy policy must begin not only in boardrooms or laboratories, but in the hearts, habits, and values of individuals and communities committed to living well within limits.

Comparison and Convergence

While Hans Jonas and Philip Cafaro emerge from different philosophical traditions, existential phenomenology and Aristotelian virtue ethics respectively, they converge on essential themes that provide a critical foundation for rethinking sustainability, particularly in the context of biomass governance. Both philosophers reject the dominant paradigm of instrumental rationality, which treats nature as an object to be exploited, and instead propose ethical frameworks rooted in responsibility, character, humility, and the intrinsic value of the natural world.

Jonas emphasizes the temporal asymmetry of modern ethical dilemmas, particularly those introduced by technology. His imperative calls for a moral responsibility to future generations and to the long-term viability of life on Earth [1]. This future-oriented framework is essential when assessing biomass strategies that may have deferred ecological impacts - such as soil exhaustion, biodiversity loss, or socio-ecological displacement.

Cafaro, by contrast, focuses on moral character in the present. His environmental virtue ethics is concerned with how individuals and societies cultivate values like temperance, simplicity, and civic care [2,4]. While Jonas looks toward the unborn, Cafaro emphasizes the daily habits and virtues that shape our collective trajectory. Yet these approaches are complementary. Jonas justifies the need for long-term responsibility, while Cafaro provides the motivational and practical virtues needed to fulfil it.

Both thinkers' critique technological overreach and the mythology of continuous growth. Jonas warns that the power of modern science must be met with an ethical restraint born of fear, a heuristic of fear, as he calls it, that reminds us of the fragility of the biosphere and

the limits of human foresight [1]. Cafaro complements this view by critiquing the vices that sustain growth culture - gluttony, greed, and arrogance - and by promoting virtues that encourage moderation and sufficiency [2].

Jonas provides a metaphysical depth to the critique by arguing that nature has intrinsic worth and that human beings have an ontological duty to preserve life, not just for utility but for its own sake. Cafaro echoes this in more accessible moral language, arguing for the development of a civic and personal ethos in which people want to live well within limits because it aligns with flourishing, not because they are forced to by regulation [5].

Jonas would argue that biomass policies must pass a stringent moral test: do they preserve the preconditions for future life, or do they carry unacceptable risks? His approach demands strong precautionary principles and accountability for irreversible harm [1]. Cafaro, on the other hand, would ask: do these policies cultivate justice, civic engagement, and ecological responsibility in the present? Are they enacted with care, humility, and regard for place? [5].

This dual framework, long-term responsibility and present virtue, can serve as a robust ethical lens for evaluating sustainability transitions. Jonas offers the justification for limits, while Cafaro shows how those limits can be integrated into everyday life and democratic institutions.

Both philosophers place high value on humility. Jonas sees humility as a response to the uncontrollability of technological consequences, while Cafaro sees it as a personal virtue that anchors respectful relationships with nature (Cafaro, 2012, p. 83). Both believe that ethics must extend beyond anthropocentrism, acknowledging the moral standing of the non-human world. However, Jonas emphasizes a quasi-transcendental duty grounded in the ontology of life, whereas Cafaro's virtue ethics is more practical and educational, rooted in civic experience and personal development.

A Call for the Virtue of Responsibility and Green Patriotism

In light of the ecological crises of the Anthropocene, both Hans Jonas and Philip Cafaro articulate a need

for a renewed moral orientation, one that integrates the classical language of virtue with the planetary scale of contemporary responsibility. Two key concepts emerge from their thought: the imperative of responsibility as a new virtue, and patriotism reimagined as environmental virtue.

By extending Jonas's responsibility ethics through a virtue-oriented and justice-based lens, this article aligns with recent philosophical work arguing that sustainability requires ethical limits grounded in responsibility rather than technological optimism alone [3].

Hans Jonas argues that the novelty of technological power, especially as it relates to environmental degradation and intergenerational harm, demands an ethical revolution. In *The Imperative of Responsibility*, he proposes not only a new principle ("Act so that the effects of your action are compatible with the permanence of genuine human life") but also a new virtue: responsibility itself. This virtue is not merely a duty but a cultivated disposition, one that must become part of our ethical character. Jonas writes that "responsibility is a virtue only when it becomes second nature," emphasizing that we must internalize this forward-looking moral sensitivity [1]. It is not enough to know the consequences, we must care for them and act accordingly, not only as scientists or politicians, but as citizens and moral agents.

Philip Cafaro complements this with his call for an ecologically grounded form of patriotism. In several works, including *Patriotism as an Environmental Virtue* (2010) and *Thoreauvian Patriotism* (1995), he redefines patriotism as a place-based, ethically responsible form of love for one's country, one that includes protecting its natural beauty, biodiversity, and long-term ecological health. This "green patriotism" stands in contrast to extractive nationalism or growth-at-all-costs development. It requires virtues of care, stewardship, and resistance to short-term economic pressures that degrade local ecosystems. As Cafaro notes, "good patriots protect the land and water that sustain their communities" [5].

Both thinkers ultimately extend virtue ethics into the public sphere. For Jonas, cultivating responsibility is essential not only for individuals but also for institutions and collective decision-making. For Cafaro,

environmental patriotism provides a bridge between personal virtue and civic action. In both cases, these concepts serve as ethical anchors in a time of instability, reminding us that sustainability is not only a technical goal but a moral and cultural commitment [8-16].

These virtues, responsibility and green patriotism, are vital for guiding biomass strategies that are just, transparent, and sustainable. Without cultivating these ethical dispositions, sustainability risks becoming a hollow or instrumental term. With them, it becomes a lived practice rooted in care for others, for nature, and for future life.

The comparison between Jonas and Cafaro reveals a dynamic interplay between principle and practice, foresight and formation, responsibility and virtue. Jonas offers the theoretical scaffolding for an ethic of planetary responsibility in the Anthropocene, while Cafaro supplies the moral texture necessary to live within those boundaries. Applied to biomass, their shared philosophy leads to a vision of circular justice - a model of sustainability that respects ecological thresholds while fostering just and ethical communities. By integrating Jonas's demand for long-term responsibility with Cafaro's call for ethical cultivation, we gain a philosophical foundation that transcends metrics and markets and instead centres humanity's moral relationship to the Earth.

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