COUNTING GAINS TO BEYOND ZERO-IMPACT FUTURES

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ABSTRACT

The paper provides learning about past failures in the uptake of sustainability imperatives from qualitative discourse analysis of selected public communication, from reviewing a novel framework and from case studies in one scientific field. Resultant concepts, strategies and solutions are offered with potential to quell emerging threats and facilitate ecological remediation. Life cycle assessments (LCA) of certified ecolabelled and business as usual production systems with comparable spatiotemporal resolution and uncertainty were reviewed. Life cycle impact assessment (LCIA) frameworks cover damages to supply, climate, habitat and human health loss. With a negative range stopping at zero, LCIA excludes positive gains in supply, climate, human and habitat security. Results of risk and benefit analysis considering strength, weakness, opportunity and threat for sustainability reporting exposed gaps creating chasms in communications. In response Evah Associates compiled the life cycle benefit assessment LCBA2020 framework for positive development. LCBA methods were developed to quantify gains in regeneration and reparation of supply, climate, habitat and wellness within planetary boundaries safe operating space. Methods were tested to supplement third party verified LCA of real-world lumber, paper, personal care and recycling product for certified ecolabels as well as whole buildings as-built and as-designed. Benefit and damage metrics are compared for supply, climate, human and habitat outcomes. Results are also shown as carbon drawdown ratings and circularity scores useful for circular economy and United Nations sustainable development goals. The work concludes LCA is one of many impactful methods counting negativity that fails to engage people or quantify sustainability. Recommendations include that positive climate and habitat security narratives can be made compelling. Proof of competitive advantage requires quantification of benefits minus burdens. Justification of investment demands reporting of gain versus loss inside planetary boundaries. Finally, it is an imperative to engage people in counting benefits and gains.

Keywords: sustainability, metrics, benefits, positive, damage, climate brake, carbon bank., security.

1 INTRODUCTION

The 2019 United Nations (UN) state of environmental report [1] emphasizes urgent and inclusive action needed to achieve a healthy planet with healthy people. The UN has long instigated plans for nations to cut climate-degenerating dependencies and curb carbon budgets to zero global warming potential (GWP) [2], [3]. Establishing sustainable markets demands transformation to regenerative supply across all jurisdictions [4].

For almost half a century worldwide, however, global calls for action and market transformation plans have failed to redress loss of biodiversity and climate viability [2]. Relentless disinformation has derided and derailed sustainability imperatives [5].

Links between drought, heat waves, wildfires and climate change are well-known as are the significant risks posed for this planet's driest inhabited continent [1], [3]. The Australian Commonwealth Science and Industrial Research Organisation [6] reports fugitive methane from oil, coal and natural gas production accounts for 6% of national greenhouse emissions. In 2018, Australia was the world's largest exporter of coal and natural gas [7], [8]. Despite synergistic risks of drought, heat waves, high fuel loads, dry lightning ignition and megatonnes of flammable methane in the local landscape Australia remains economically dependent on extracting, using and exporting fossil fuels.

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2 BACKGROUND

This section aims to bring patterns of language, imagery and metrics relating climate and habitat into focus for closer examination. Selected extracts from global headlines between 2 December 2019 to 4 February 2020 relate verbal, written and visual examples.

2.1 United Nations (UN) Conference of the Parties (COP) on climate change

On 15 December 2019 at the UN COP25 summit in Madrid, world leaders condemned the Australian Federal administration for claiming Kyoto protocol carryover credits to meet 2030 emissions reductions targets [9]. Delegates had argued that such feeble negative targets and cheating responses belied the emerging climate change threats.

2.2 Black summer bushfires confirm climate crises

On 2 January 2020, from Cobargo in his bushfire-devastated Australian electorate, New South Wales Parliamentary Minister, the honourable Andrew Constance told of horrific experiences despite the worst of the fire-season remaining. He confirmed the grass roots reality of unprecedented drought, heat, wind, dry fuel load, forest wild fires and black daytime skies. Continental-scale forest, farm, property, business and job losses in the black-summer fires were then compounded with hazardous smoke choking most capital cities. As parliament resumed on 4 February, Andrew focussed on recovery and forecast Cobargo and Bega to win the "best recovery this planet has ever seen" [10].

2.3 Unprecedented global biodiversity loss in one summer

On 10 January 2020, the Australian Academy of Science President, Professor John Shine wrote "the scale of these bushfires is unprecedented anywhere in the world" [11]. They are the largest across any megabiodiverse country and larger than Amazonian and Californian fires in 2019. The world has lost extraordinarily high value biodiversity and over a billion birds, mammals and reptiles to date this Australian bushfire season.

2.4 Avert climate apocalypse

On 21 January 2020 at the World Economic Forum (WEF), youth activist Greta Thunberg addressed the Forum at Davos in Switzerland. The 17-year-old spoke beside imagery of a kangaroo bounding from Australian bushfires under an "Averting Climate Apocalypse" banner. She urged global leaders to stop "cheating and fiddling around with numbers". "Our house is still on fire and you're fuelling the flames" [12].

2.5 Climate alarmists all seeking absolute domination

A few hours later, the President of the United States of America, Donald Trump, told the Forum to dismiss "the prophets of doom" on climate change as "They are the heirs of yesterday's foolish fortune tellers," and "These alarmists always demand the same thing: absolute power to dominate, transform and control every aspect of our lives" [13].

2.6 People power can create sustainable markets

The next day HRH the Prince of Wales queried in his WEF Forum keynote address: "what good is all the extra wealth in the world, gained from business as usual, if you can do nothing

with it except watch it burn in catastrophic conditions?" [4]. The prince sought forum skills to "lead the world out of the approaching catastrophe". He advised "with consumers controlling an estimated 60% of global GDP people around the world have the power to drive the transformation to sustainable markets". He proposed ten investment, troubleshooting and innovation actions citing internet and iPhone examples.

2.7 Doomsday clock nearing apocalypse

As they do annually, on 23 January 2020, the Bulletin of the Atomic Scientists reset the internationally recognized doomsday clock. The bulletin was founded by Manhattan Project scientists after atomic bombs destroyed Hiroshima and Nagasaki. Considering threats from nuclear war, climate change and disinformation they advanced the doomsday clock time to 100 seconds to midnight, the symbolic apocalypse hour [14].

3 LEARNING FROM FAILURE

The aims in this section are to reveal patterns in such narratives limiting success and to expose gaps offering opportunity for action to redress such climate and habitat issues. Qualitative discourse analysis of such narratives was used to assess content meanings.

3.1 A seasonal situation appraisal

Most introductory negative narratives conveyed bad news on unprecedented disasters and loss and forewarnings of doom. Accusations of blame, shame and stalling were rife. Words, images and accounts to shock and stun dominated despite risks of demotivating audiences. Positive narratives were uncommon, however, after negative appraisals, two speakers gave positive take-home messages. Words to shock, scold or mock included:

- COP25 world leaders condemning one party of cheating even on feeble targets;
- John reporting globally devastating losses in one season;
- Greta chiding elders for irresponsible fiddling and fuelling apocalyptic flames;
- Donald scorning foolish, alarmist, absolute power-seeking prophets of doom; and
- the doomsday clock set to 100 seconds to midnight, the symbolic apocalypse hour.

3.2 Positive corollaries for strategic planning

As negative accounts of loss dominated such public, political and economic communications, it was posited that positive accounts of gain may be more useful to accelerate sustainability. Table 1 shows positive qualities and measures developed as corollaries to detrimental attributes across a strategic planning framework. This produced a set of positive qualities for sustainability planning and regeneration assessment. It depicted new patterns of positive communications with potential to:

- avoid the loss focus, problem-centric negativity, threats, blaming and barriers;
- listen to all sides to understand, engage, persuade or advocate win–win solutions;
- adopt solution-centric positive words, metrics and images to gauge or gain progress;
- use words, artforms and humour to reflect climate and regeneration solutions;
- inspire hope by sighting and faming regenerative steps for overtaking degeneration;
- create, drive and grow investment and work opportunity in sustainable markets;
- inform, educate and transform endemic ignorance, isolation and complacency; and
- disarm opponents, refute disinformation, divert self-interest and inspire advocacy.

Table 1: Qualities and measures of narratives.

System	Negative detriments	Positive benefits
Policy	Control burden, loss and deficit	Control benefit, gain and surplus
Purpose	To slow depletion and degeneration	To grow repletion and regeneration
Goals	Score on loss in carrying capacity	Score on gain in carrying capacity
Scope	Negative to zero; excludes gain	Positive to zero; excludes loss
Measures	Natural asset degeneration and deficit	Natural asset regeneration and surplus
Capacity	Natural assets at current scarcity	Natural assets at former abundance
Range	Full loss origin to zero end	Zero origin to full gain end
Reach	Approach lower no loss scores	Approach higher full gain scores
Catalysts	Scolding; Sticks to abate	Praising; carrots to assert
Narratives	Bad news; glass half empty; criticism	Good new; glass half full; praise
Games	No win; lose loss; blame; opposition	Win–win; add gain; fame; accord
Sightlines	Blind to opposing opportunity	Sighting beyond opposing opportunity
Responses	Ignore, deny, cheat and blame	Agree, declare, honor and emulate

4 MAPPING GAPS IN REFERENCE FRAMEWORKS

This section considers nested reference frameworks of the UN System of Environmental Economic Accounting (SEEA), International Standards Organisation (ISO) for environmental management systems (EMS), life cycle assessment (LCA), life cycle inventory (LCI), life cycle impact assessment (LCIA) and environmental product declarations (EPD). Qualitative gap analysis was used to examine patterns in framework strengths, weakness, opportunity and threats in quantifying climate and habitat change.

4.1 Limited reach of references frameworks

The UN et al. [15] SEEA framework covers benefits from direct use of environmental inputs but excludes indirect benefits from ecosystem services such as water purification, carbon storage and flood mitigation. LCA was designed to reduce industrial pollution and resource depletion which are negative burdens rather than positive benefits. The ISO EMS 14044 standard for LCI and LCIA [16] demands EPDs use ISO 14025 compliant methods to count damage in as well as benefits beyond the system boundary. In the Evah Institute authors' experience these are declared as reduced damages not positive benefits.

4.2 Applications of invalid LCA metrics

A letter from 25 non-government organisations (NGOs) across six countries [17] submitted at the ISO TC 207 meeting on EMS at New Delhi in October 2015 called on the ISO to correct methods for LCIA of climate change. It demanded that clearly from the International Panel on Climate Change (IPCC) "we must act with significant emissions reductions in the next 5–10 years if we have any hope of avoiding irreversible climate change. Having a proper set of metrics installed to steer policy in the short amount of time we have to act is critical, as these metrics are essential guides for any type of informed decision making".

It argued that issues with ISO 14044 climate metrics used to asses 300,000 companies' products and systems worldwide included:

- invalid use of 100-year horizons that ignore imminent climate tipping points;
- effectively ignoring biomass emissions from forest and paper industry sources;
- excluding 60% of global radiative forcing caused by short-lived climate forcers;
- underestimating by 80% short-term climate benefits of less methane emissions; and
- overlooking mitigation opportunities in climate hot spots.

5 DERIVING BALANCED FRAMEWORKS

The previous section reviewed framework gaps, strengths, weakness and threats considering wellness and security of supply, climate, habitat and people. It reviewed gaps and threats limiting application, opportunity and investment in sustainable markets. This next section contrasts LCIA of damages against life cycle benefit assessment (LCBA) of gains. It reviews LCBA framework, measures and metrics and provides examples.

5.1 Negative LCIA reach

Established LCIA applies frameworks and metrics such as Goedkoop et al. [18] report for "ReCiPe" metrics in Europe and Bare [19] reports for "TRACI" metrics in America. Both cover borrowings of natural capital, costs to nature, damages to supply, habitat and health. Both lack positive reach beyond zero to leverage benefit or gain. Fairly typical LCIA is depicted in red in Fig. 1, schematic of LCIA versus LCBA depicted in blue.

5.2 Positive LCBA reach

Concomitant positive LCBA depicted in Fig. 1 supplements negative LCIA. The scope extends from zero to positive outcomes in safe operating space within planetary boundaries after Rockström et al. [20]. Regeneration benchmarks are to preindustrial C18 natural capital and wellness benchmarks are to current population longevity as is most appropriate.

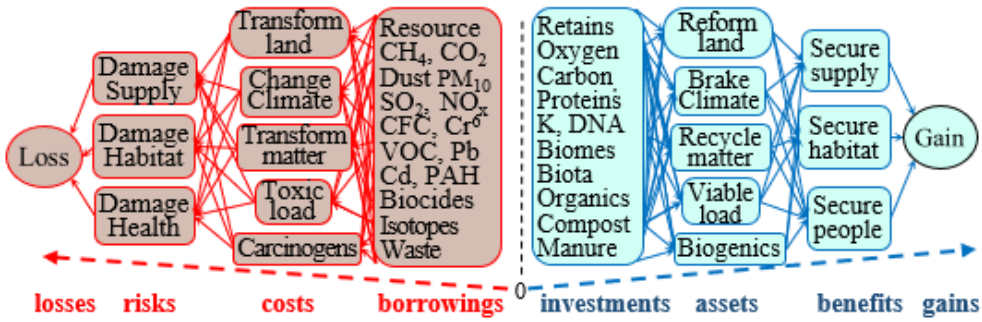

Figure 1: Schematic of LCIA (red) versus LCBA (blue).

5.3 LCBA framework measures and metrics

Table 2 shows LCBA metrics for regeneration across natural capital assets derived from Evah Institute frameworks reported by Jones et al. [21] and Baggs et al. [22]. Their strategic purpose is to assess remediation. Such metrics quantify security gains in supply, climate, habitat and people per capita per annum (pppa). These measures of repletion and regeneration also cover potential capacity to return assets to former abundance.

Table 2: LCBA metrics.

Viable	Security benefit considering		%
Supply	Sustainable versus finite		MJ ncv
	Water	Rain versus town water	kl rate
	Fuel	Renewable versus fossil	MJ rate
	Minerals	Recycled versus primary	t rate
Climate	Current versus C1750 carrying capacity		/m^2
	Braking	Biomass carbon capacity	CO_2e_{20}
	Banking	Soil carbon capacity	CO_2e100
Habitat	Current versus C1750 carrying capacity		/m^2
	Ecosystem	Species richness capacity	rate
	Urban	Natural habitat capacity	rate
	Aquatic	Marine oxygen capacity	rate
People	Hale able lifespan years		pp
	Air indoor	Indoor oxygen supply	O_2e
	Airshed	Pollution-free clean-air	days
	Fecundity	Reproductive survival	rate

Climate security gains, for example, arise as carbon drawdown from the atmosphere acts as a brake on climate change. Sunlit photosynthesis in chloroplasts transforms carbon and water into forest, heath, kelp and algae growth. As a consequence, fixed carbon in plant cells walls and roots is banked until drawn out again decades to centuries later.

Again, for example, high-energy ultraviolet rays split oxygen molecules for continuous stratospheric ozone repletion and to brake climate change. Up to 15 km below from the troposphere surplus photosynthetic oxygen also acts as reserve banks to meet demand for animal respiration and fuel combustion to maximum carrying capacity.

6 EARLY LCBA CASE STUDIES

This section reviews Evah Institute reported [23] ISO compliant third party verified LCA methods for certified commercial product ecolabels and Evah Institute developed EPDs. Results of LCIA and LCBA studies with comparable uncertainty and spatiotemporal resolution are shown for a range of applications, damages, benefits and circularity scores.

6.1 Damages to supply, climate, habitat and people

Table 3 shows annualised negative damage and loss results/kg from cradle to grave LCIA. Forest product results were from Vlieg et al. [24]. Evah reported [28] LCIA of FSC toilet paper 8 kg pppa typical use over 20 years. Luo et al. [25] reported the results for organic beeswax, propolis and honey.

Table 3: Forest and apiary product damages.

Loss in	Damage to	Unit	Board	Paper	Wax	Propolis	Honey
Supply	Fossil fuel depletion	MJ $_{ncv}$	12	286	<0.01	<0.01	<0.01
	Mineral depletion	MJ $_{ncv}$	0.05	0.19	2.4E-03	1.6E-03	3.0E-04
Climate	Stratospheric ozone	kg $R11_e$	3E-08	4E-08	4E-12	3E-12	5E-13
Habitat	Ecosystem quality	/m^2pa	7E-05	4E-03	4.0E-04	3.0E-04	5.0E-05
People	Human health	DALY	3E-04	3E-02	1.3E-03	8.0E-04	2.0E-04

6.2 Benefits to supply, climate, habitat and people

Table 4 shows concomitant gains and benefits for those same forest and apiary products and reference units. Current climate braking intensity was rated as $kgCO_{2e}pa/kg$ product. Apiary product results outside that study scope are not reported for all outcomes. Beeswax was the top climate brake rated at 21, then propolis at 15 before particleboard at 10. The low rated 2 $kgCO_{2epa}/kg$ honey is a wet brew that bees make in wax-capped vats in honeycomb. The 1 $kgCO_{2e}pa/kg$ tissue used energy intensive wet chemical processing.

6.2.1 Circularity scores

Table 5 shows high circularity scores for these products except for water renewal. Making board and paper generated steam not water condensate. Scores were not reported here for honey due to unacceptable uncertainty in evaporation from its high-water content.

6.3 Negative building system outcomes

This section reviews Evah Institute LCA [29] of commercial offices per gross floor area (GFA)/m^2pa. Table 6 shows reduced new tower damage versus business as usual (BAU). The LCA lacks positive outcomes because all environmental damage and natural asset loss from building elements outweighed all positive security benefits and gains from the others. The new tower, nevertheless, earned four green stars from the Australian Green Building Council. This reflects greener as less negative rather than positively sustainable.

6.4 Positive building system outcomes

The following Evah Institute developed [30] cradle to grave LCA for an EPD and certified ecolabel covered 60-year use of a 1.35 t garbage diverter in residential high-rise building.

Table 4: Forest and apiary product benefits.

Viable	Security benefits	Unit	Board	Paper	Wax	Propolis	Honey
Supply	Matter renewal	MJ	378	5476	Not reported		
	Energy renewal	MJ	75	6296	Not reported		
	Water renewal	litre	10	16	11,900	7,900	1,300
Climate	Climate brake	kg CO_{2e20}	47	221	21	14	2.2
	Climate bank	kg CO_{2e100}	38	590	23	16	2.5
Habitat	Forestry	MJ	452	6163	Not reported		
	Biodiversity	m^2pa	0.26	483	Not reported		
People	Wellness	HALY	1E-4	0.01	Not reported		

Table 5: Forest and apiary product circularity scores (%).

Viable	Security benefits	Board	Paper	Wax	Propolis
Supply	Feedstock renewal	82	87	100	100
	Water renewal	9	0.5	100	100
Climate	Climate brake	181	100	100	100
	Biomass bank	104	38	100	100
Habitat	Forestry biota and seed	73	89	100	100
	Habitat biodiversity	99	99	100	100

Table 6: New versus BAU building damage results.

Losses and damages to	Unit	BAU	New	% less
Global warming	kg $_t CO_{2eq100y}$	1041	874	19
Stratospheric ozone	kg CFC_{11eq}	1.1E-06	9.9E-07	10
Photochemical smog	kg C_2HO_{4eq}	1.59	1.45	10
Depletion fossil fuel	MJ	647	577	12
Depletion elemental	kg Sb_{eq}	2.61	2.38	9.7
Acidification	kg SO_{2eq}	11.9	10.4	14
Eutrophication	kg $PO_{4\ eq}$	0.52	0.46	13
Human toxicity	kg 1.4-DB_{eq}	3.10	3.05	1.6
Land use change	m^2 pa	1.1E-05	9.6E-06	15
Depletion water	kl	10813	9040	20
Ionising radiation	kBq $U_{235\ eq}$	9.4E-12	8.6E-12	9.3
Particulate matter	kg $PM_{2.5eq}$	74118	65063	14

Table 7 shows annualised damages from diverter manufacture versus benefits in space and recyclate supply reported by Jones et al. [21]. Gains pa/kg diverter included:

- supply chain reclamation of 1,550 GJ energy and 1,082 Ml potable water;
- habitat vigour without 2,620 kg PO_{4e} eutrophication or 350 kg 1.4 DBe toxicity; and
- wellness from clean air without 0.1 kg PM_{10} fume and 0.12 g 1.4 DBe toxicity.

Table 7: Diverter damages versus benefits.

Viable	Security benefits	Units	Chute	Space	Recycle	Gain
Supply	Energy recovery	GJ	-667.0	110	93,530	92,973
	Water recovery	Ml	-5.0	76	64,877	64,948
Habitat	Climate brake	t $CO_{2e\ 20}$	-100	<100	4,000	4,000
	Habitat regain	m^2*yr	-0.4	0.1	35	35
People	Hale wellness	years	-6.8	0.9	457	451
	Ozone refill	g $R11_e$	<-0.1	<0.1	14	14

6.5 Sustainable building benefits

This is followed by a review of Evah Institute LCIA and LCBA for an Interpretive Centre in Brisbane described by Baggs et al. [22] The LCA done for the project was first reported by Renger et al. [31] in a paper entitled "Net-positive building carbon sequestration". Subsequently, Cole [32] cited this LCA as a world-first in building design in his editorial for a special issue entitled "Shifting from net-zero to net-positive energy buildings", of the building research and information journal.

Table 8 shows sustainable building benefits for that centre yearly/m^2 GFA. Except for eutrophication that called for mitigation in use, the benefits and natural asset gains outweighed loss. No overall damage arose in:

- climate change from global warming or loss of stratospheric ozone;
- polluting smog, acidification, ionising radiation, particulates or toxicity; and
- depletion of freshwater, fossil fuel, elements or land available for nature.

Table 8: Sustainable building benefits.

Viable	Security benefits	Unit	Gain
Supply	Feedstock retain	MJ	19.9
	Mineral retain	MJ	0.1
	Energy renewal	MJ	1.5
	Matter renewal	kg	26.7
	Water renewal	kl	30.1
Climate	Near term carrying capacity		
	Climate brake	kg CO_{2e20}	42.2
Habitat	Current carrying capacity/m^2		
	Ph balance buffer	PRF	4.7
People	Hale able lifespan years pp		
	Hale wellness	years	0.05
	Clean airshed	kg O_{2eq}	25.2

6.5.1 Sustainable building landscaping benefits

Table 9 shows annual cradle to grave gains across the centre's interior and exterior wall, roof and curtilage landscaping pa/m^2 GFA. Benefits flow from building green walls acting as a climate bank. Oxygen generation enables stratospheric ozone refill adding to climate and habitat security as well as wellness of people.

Table 9: Built landscaping benefits.

Elements	Area m^2	Climate banking	Units	Oxygen airshed	Units
Green walls	5,530	6.6	CO_{2e100}	4.8	kg O_{2eq}
Landscaping	19,600	2.8	CO_{2e100}	2.1	kg O_{2eq}
Atriums	800	1.5	CO_{2e100}	1.1	kg O_{2eq}
Rooftops	710	1.4	CO_{2e100}	1.0	kg O_{2eq}

7 DISCUSSION OF STRATEGIES AND SOLUTIONS

While the paper focussed on LCA, the same principals of communication apply to most city, polity and economic planning tools currently used to reduce unsustainable outcomes.

7.1 Negative communications culture

Criticism and blame headlines appear aligned to combative disinformation. Negative narratives are commonplace and evident in book titles such as "Cannibals with Forks" and the global youth movement "Extinction Rebellion". In a world-wide loss and blame culture the authors argue that climate and habitat regeneration depend on addressing:

- misunderstood counterintuitive earth-system feedback-looped interactive effects;
- ageist bias affecting youth with climate change and extinction legacy locked-in;
- ecologically-blind sciences, economics, polity and law not yet addressing ecocide;
- acquisitive intensive lifestyles underpinning inequitable and unsustainable markets;
- cumulative self-interest against common good that is stalling climate crisis summits;
- end-use focus ignoring cradle to fate damage and depletion of natural assets; and
- urban ecophobia excluding wildlife, marsupials, birds, bees and worms as vermin.

7.2 Damage focussed frameworks

Discourse analysis of public communications and core references frameworks showed reliance on negatives narratives and metrics. All frameworks sampled exclude critical positive gains in security of supply, climate, habitat and people wellness. Their negative range stops at zero damage to supply, climate, habitat and people. Their ignorance of positive ideation beyond zero loss creates chasms for assessment in sustainable markets.

7.3 Negative business culture

Many companies use negative environmental assessment frameworks and LCA standards that ignore highest short-term climate risks. EPD metrics often exclude IPCC factors for short term damaging carbon emissions and beneficial sequestration but not biogenic methane emissions. This acts as a barrier to climate and habitat recovery. Entities upholding such barriers to sustainable markets profit from tragedies of the commons.

7.4 Positive solutions culture

Positive calls to action across industry, political and social networks can synergise initiatives and invite participation from wild-lifers, regenerators, sapling armies, climate bankers, carbon jesters and honourable ancestors. Positive narratives are needed in:

- education to learn earth-system feedback-looped interactive wizardry and apps;
- ethical investment in climate braking and regeneration outcomes;
- eco-wise science, economics, polity and law to address ecocide and eco-loss;
- trending dematerialised renewal lifestyles securing climate and equity;
- promoting wildlife corridors and care for native animals, birds, bees and worms;
- drones and apps for mapping ecophylic roads, towns and cities; and
- developing narratives to promote engagement in repletion and drawdown initiatives.

7.5 Distinctive competitive advantage

A distinctive competitive advantage of LCBA is that for the first time it can balance LCIA. This allows systematic quantification for reporting both losses and gains essential for investment in sustainable markets. It can also clarify unsustainable market activity.

8 CONCLUSIONS

Negative narratives do not motivate people to avert the climate and extinction crises. The unsustainability focus of core frameworks that influence policy remains blind to solution-centric sustainability measures. LCIA methods exclude IPCC factors of highest short-term climate risks. Positive frameworks, strategies and quantitative methods to address ecological remediation cover security of supply, climate, habitat and wellness. New terms and metrics are needed to inform science, industry and community initiatives in sustainable markets. Case studies comparing LCIA and LCBA showed accounting beyond zero loss to include gains in security of supply, climate, habitat and people. Positive narratives and measures are considered vital to provide new capability, tools and applications to assess benefits; initiate, cover and deliver balanced sustainability analysis for sustainable markets; power to create traction in sustainable market initiatives and investments; and uphold discretion that ensures unbiased and equitable gains in sustainable outcomes.

9 RECOMMENDATIONS

Espousing benefits and counting gains to engage people is an imperative. Compelling climate and habitat security narratives around carbon drawdown are needed at this critical time in human development. Theoretical and practical transitions are vital to extend negative perspectives beyond zero damage and loss to bridge barriers to positive viewpoints with sightlines to discern future benefits and gains. Beyond reducing pollution and degradation, inhabitants of a sustainable world must regenerate natural assets. Justification of investment in sustainable markets calls for quantification of benefits and gains of natural assets as much as damages and losses.

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