Quantifying Nature Positive

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Abstract: To become mainstream, Nature Positive development needs positive messaging, measures and metrics to guide, plan and assess urban outcomes. With accelerating climate crisis and negative messages getting the upper-hand, it is important to avoid paralysis by bad news. Whilst striving for a nature positive world, more effort should be on moving beyond zero to qualify and quantify benefits, gains and regenerative outcomes instead of around damage and loss sticking points. Life Cycle Benefit Assessment (LCBA) methods measure gains in accelerating regeneration and climate security that enables a good news focus. Its reach beyond negative quantifies and shows positive gain beyond zero loss outcomes. The aims are to clarify concepts, challenges and quantitative methods then review real-world 3rd party Certified nature positive case studies. Climate security, human wellness and resource viability gains inside safe operating space within planetary boundaries are quantified as positive benefits. Contrary to conventional Life Impact Cycle Impact Assessment, LCBA assigns damage losses as negatives debts and benefit gains as positive savings. It concludes that LCBA remains under development with more research needed to model economic outcomes.

Keywords: Nature-Positive, Quantified Benefit Assessment, Security, Wellness, Viability, Gain

1. Introduction

With conclusions providing certainly that most forcing is from human technology the latest 2021 IPCC report erased doubt about anthropogenic climate change [1]. Global governments, leaders, business and non-government organisations (NGOs) meeting in Glasgow at the 2021 UN Climate Change Conference of the Parties COP26 summit agreed on the urgency to mitigate global climate change's ensuing human health damages and biodiversity loss [2]. Previously at the 2020 UN General Assembly and Biodiversity Summit, global NGOs and business organisations urged leadership to set a clear and Nature-Positive Global Goal to create an "equitable, carbon-neutral, nature-positive world" [3]. It demands stopping damages from climate change and loss of biodiversity Nature positive is also to enhance nutrition, employment, wellness, education and economies.

Climate security demands abatement and sequestration must exceed global warming emissions. In other words, 'doing more good than bad' [4]. Figure 1 depicts 3 measurable biodiversity objectives to achieve a nature-positive world: net zero loss from 2020, net gain by 2030 and full gain recovery by 2050 [5]. Other measures include reafforesting 350 MHa and revegetating 20% native flora while protecting >30% land, ocean and freshwater communities [2]. In 2007 Birkeland wrote that "If we are serious about 'sustainability', then, it is necessary that development work increase the Earth's ecological health, resilience and carrying capacity, and protects biodiversity in order to meet even the legitimate demands of existing populations" [6]. A global survey in 2021 found while 60% of youth were worried or very worried about the future, their addiction to new gadget and electronic equipment use had skyrocketed despite "climate anxiety" [7].

1.1. Positive development

Urban green space for gardens on ground-level, roof-tops and vertical walls can improve biomass production and ecological carrying capacity [8]. Urban positive development concepts to enhance food growth, air quality, insulation, local amenity, profit and ecology from Birkeland 2007 include

- Food production frames, wall with shutters, shelves, aquaponics, hutch, bird cages;
- Converting organic waste into fertilisers using bacteria;
- Creating green space and landscapes to support wildlife [7].
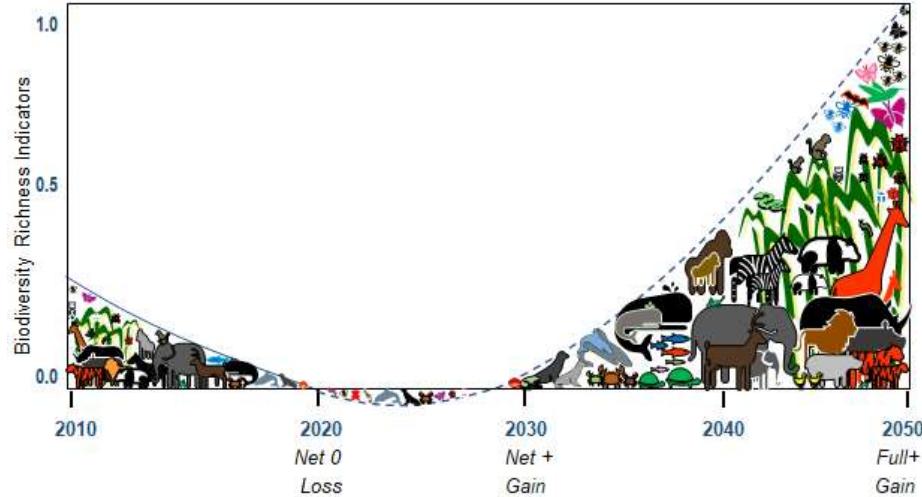
Figure 1. From 2010 to Nature Positive full Gain by 2050.

Such positive social and ecological development strategies offer human and planetary wellness. Positive Development (PD) aims to improve ecosystem capacity for services as well as natural, social and economic capital by modifying buildings, infrastructure, landscapes and products [9]. In 2015 a PD framed building design for carbon drawdown, human wellness and natural capital regeneration, employed a carbon amortization performance method to LCIA and LCBA done by Evah [8]. Cole cited it as a world first in quantifying carbon drawdown over the full whole building life cycle cradle to grave [10].

1.2. Negative framing

Today most climate change and sustainability news stories are negatively framed on humanity's losses from damages cause by climate change [11-12]. And LCA fits this negative news story framing. Originally conventional LCA was developed to quantify production systems causing environment and human health damages. In other words, LCA was loss-framing to show negative outcomes. Figure 2 depicts ReCiPe LCIA damage categories [13]. End point damages include damage to human health, ecosystems and resource availability and mid-point damages include:

- Ozone Layer Loss, Toxic Air Quality and Climate Change;
- Depletion of Terrestrial, Marine and Freshwater biodiversity;
- Limited availability of Water, Fossil Fuels and Minerals.
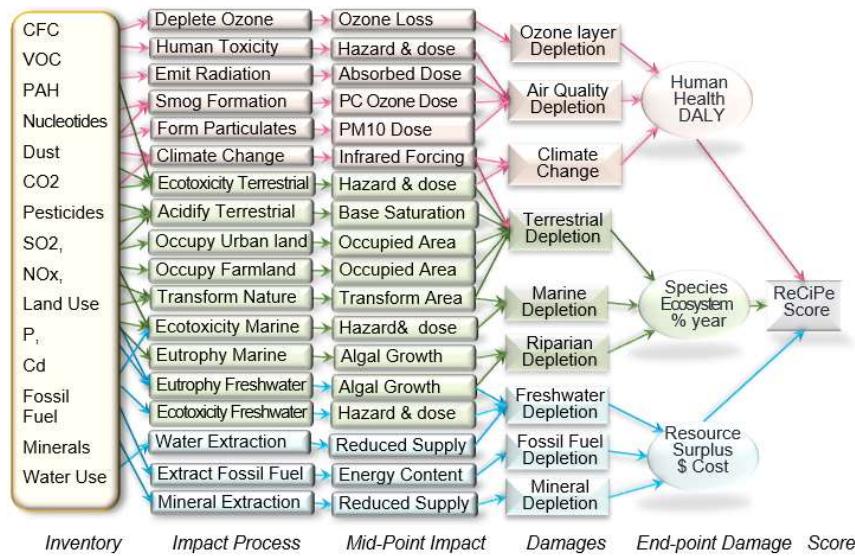
Figure 2. Schematic of ReCiPe 2009 LCIA Method.

The literature applies positive impact to different concepts so reduced negative impact can also show a positive impact/benefit [14]. Most definitions of positive environmental impact derive from social analysis related economic and social 'unburdening/benefit' of improved performance beyond compliance [15-16]. The authors, however, define positive benefits as gains that exceed damages in the same system [17]. In the broadest sense it is vital to recognize that benefits offer solutions far beyond loss reduction [18].

1.3. Positive framing

Despite LCA framing bad news, some new concepts, instead, focused on creating better and more positive outcomes. Early in the 21st century, Cradle to Cradle (C2C), Blue Economy, Circular Economy and UN development goal concepts all emerged [19-20]. These good-news-stories actually got people, manufacturers and policymakers activated to invest in sustainability. Positive social and environmental outcomes include healthier space for local flora, fauna and human communities and natural habitats, oxygenated airsheds and carbon storage for climate abatement, cleaner air and water, reduced rain runoff plus job creation [21]. One example is use of an onsite green roof wind turbine for air cleaning, CO2 drawdown and biodiversity gains cradle to grave over the system life.

1.4. Gain-framing versus loss-framing

Both gain-framing and loss-framing methods can be useful when trying to galvanise popular actions. Loss-framing conveys adverse losses of inaction, while gain-framing conveys beneficial gains of action [22]. Both methods can be effective, but which has most power is often situation-dependent. Much research has been done in psychology on gain-framing vs loss-framing in general as well as in journalism and politics on positive vs negative stories.

In journalism, research suggests that while negative news is more attractive, it does leaves people more distressed. Negative news media and televised articles also negatively influenced how people felt about unrelated personal issues. Negative articles with positive perspectives however, left viewers more interested in the topic, with fewer negative emotions often reading further [23].

Research on gain-framing versus loss-framing in the climate change field comes to similar conclusions. Research done in Tehran, a city affected by high air-pollution, found that positive framed messages to citizens left them more inclined to change modes of transport from car to bus or bicycle to improve air pollution [24]. Another study found

increased recycling rates in response to advertising new products made from recycled material and not avoiding virgin material or landfill [25].

The literature generally suggests loss-framing stimulates changed behaviour for risky outcomes whereas gain-framing is better for surer outcomes [22-23]. The literature considers climate change a certain outcome; humanity has a good overall idea of sea-level-rise and increased extreme storms, heat waves, drought, and wildfires despite their unpredictability in time, place and severity. Therefor gain-framing should be expected to stimulate more behavioural change. One guide adds strategies need alignment to create long-term, positive impact to be environmentally restorative [26]. Some researchers argue that maximising positive benefits is more important than minimizing damages considering especially now to reach a 'Net Positive' world by 2030 [9,15,18].

2. Benefit advantages for LCA

Quantification of net positive benefits is vital as it shows gain framing of opportunity, advantage and hope to contribute to recovery of nature. Considering the previous section, it becomes clear why gain-framing used for Circular Economy, C2C, Blue Economy and recently also Handprint Analysis enabled them to quickly gain momentum [26-28]. LCA, meanwhile, continues using loss-framing and having an unpopular image. Nevertheless, while Environmental-LCA (E-LCA) is lagging, the Social-LCA (S-LCA) methodology does already include some positive benefits [15].

About this inclusion Di Cesare says that, among other things, "positive impacts are meant to encourage performance beyond compliance" and that "In order to increase the relevance of S-LCA for policy support, the development of indicators addressing both negative and positive impacts is fundamental." He also states that "addressing these social positive impacts help communities to identify development objectives and ensure that positive developments are maximized" [16].

Similar arguments apply for including benefits into E-LCA, especially now at a time when people from the youth to elders in the Extinction Rebellion movement and all nations at the UN COP26 summit show it is vital to create a net-positive regenerative society. This comes with a necessity to quantify system benefits alongside with damages. LCBA can incentivize manufacturing to design for such a society and stimulate consumers to invest in regenerative lifestyles.

3. Challenges for including benefits in LCA

Adding benefits to the LCA framework has potential risks including double-counting, ethical objections and greenwashing [29].

3.1. Double-counting

Double-counting whole or part of the benefit must be avoided. Allocating reuse or recycling as an avoided burden while for example also counting it as a benefit is double-counting. So what is classed as a benefit must be clearly defined. Because double-counting is a risk in conventional LCA that must also be avoided, it is not necessarily an additional risk for LCBA.

3.2. Ethical objection

Ethical objections arise when benefit outcomes in one category offset damages in another category, location or time in any system. Indeed can, for example, smog avoidance in Western Europe relate to such emissions in South-East Asia or can any short-term benefits or damages relate to those benefits long-term?

As such considerations already abound in LCA, the onus is on decision-makers to deal with them consistently and transparently. So ethical issues in LCBA are comparable to LCIA whilst benefits and damages are declared separately as well as net. While such challenges darise in environmental LCIA and LCBA they also arise more in S-LCA [29-30].

3.3. Green-washing

Greenwashing arises where product marketing conceals impacts but promotes benefits. This is a certain risk of declaring only net-benefits after subtracting damages. This can lead manufacturers, distributors and users to put more effort in maximising their benefits instead of minimising their impacts. Greenwashing and marketing on benefits alone, however, threats in LCIA are not new. No net-benefit result should be declared independent of gross damage in any category. As negative results are essential for ecological, human and workplace health due diligence none should be ignored. Such risks confirm both LCIA and LCBA equally need transparent communications.

4. Defining positive benefits

A net-benefit is defined as a gain that exceeds system damages. Benefit quantification with traditional LCA is important to show gain-framing from systems qualifying and quantifying opportunity, advantage and hope to contribute to recovery in nature. We must however stress again the importance of understanding that whilst reduced damage is a relief, this is not the same as a positive benefit, as this concept is often confused in literature and in other methods.

Handprint assessment for example describes results as "the positive climate impact of a product" [25]. Their results are calculated by subtracting a product's result from those of a benchmark product, therefore only measuring reduced negative damages, not benefits or "positive outcomes".

5. Methodology

Evah LCBA was developed to quantify positive outcomes in Climate Security, Hale Human Health, Ecosystem Replenish**ment** and Supply Viability [17-18]. Figure 3 shows Evah LCBA flows. This is opposed to conventional LCIA in Figure 2. LCBA benefit categories were developed to address LCIA impact categories, for example including

- Climate Security versus Climate Change;
- Hale Human Health Years versus Damage to Human Health;
- Positive Ecosystem Replenished Formation versus Damage to Ecosystems;
- Supply Energy & Resource Viability versus Damages to Resource Availability.
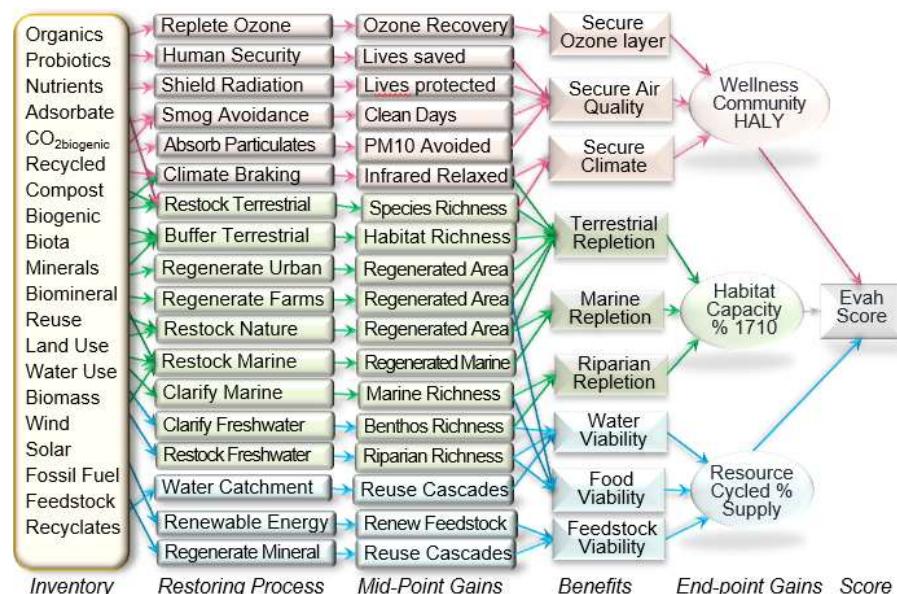
Figure 3. Schematic of Evah 2022 LCBA Method.

5.1. Benefits versus gains

Where benefit can have a direct damage off-set, for transparency, conventional LCA damages versus LCBA gains can be declared in the same table or graph. Conversely, where damage categories lack a direct benefit category off-set and vice versa, net-damage and net-benefit cannot be calculated.

As Figure 4 depicts, however, LCBA is modelled from zero to gain capacity whereas LCIA is modelled from damage capacity to zero loss.
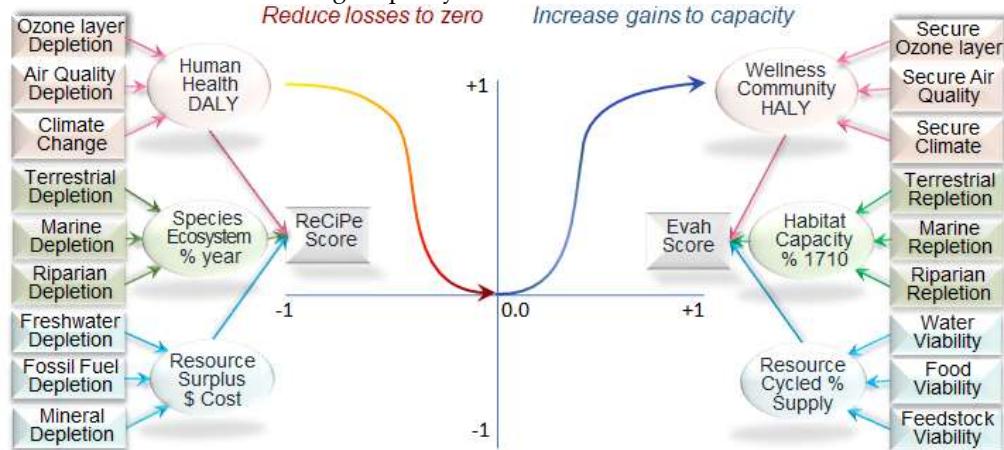
Figure 4. ReCiPe 2008 LCIA Negative Score Versus Evah LCBA 2022 Positive Score.

5.2. Life Cycle Benefit categories

Table 1 shows beneficial flows do reflect regenerative qualities so LCBA categories can include:

- Climate Security: Climate safety brakes and bank deposits, soil C banks, Ozone repair, Oxygen safes;
- Hale Human Health Years: time gained free of environmentally induced illness and disability;
- Positive Ecosystem Replenished Formation: regeneration of species richness and habitat security;
- Supply Energy & Resource Viability: reliance on renewable energy and feedstock circularity.

Tabled in each category, regional thresholds are defined by safe operating space carrying capacity within planetary boundaries or World Health Organisation wellness limits. LCBA uses pre-industrial revolution thresholds for climate, ecosystem and resource regeneration categories as the literature shows climate forcing emissions escalated from C1750 [31]. It lists LCBA categories, divided into benefit layers, units, circularity scores and climate braking factors [17-18,32].

Charting un-sustainable, sustainable, or regenerative summed and partial results is also practical [31]. Figure 5 charts negative and positive results for products A, B and C. Considering benefit minus damage, A has a net-positive regenerative gain but B and C show net-negative damage. Product B's damage within the earth's carrying capacity can be called sustainable, but as the product C total is outside that carrying capacity its results show it as un-sustainable.

5.3. Safe operating space within Planetary Boundaries

This carrying capacity threshold, is a hypothetical one depicted to clarify why reduced damage can remain a negative outcome rather than a net positive benefit. Some authors argue that such planetary boundaries concepts are incompatible with damage-

based LCIA [33]. They see the main purpose of such boundaries is to raise tipping point issues so these should not be used as targets in LCIA.

Table 1. Evah LCBA Benefit Categories & Circularity Metrics.

Benefit Layer	Positive Outcomes per Jurisdiction	Unit pa	Circularity
Climate security (CLIMES)		CLIMES /kg	%
Climate Brake	Near Term Carbon Drawdown	kg CO_{2e20}	$B_{rake\ GWP}$
Climate Layby	Near Term Carbon in Product	kg CO_{2e20}	$S_{ink\ GWP}$
Climate Bank	Far Term Carbon in Product	kg CO_{2e100}	$L_{ife\ GWP}$
Soil Carbon	Far Term Carbon bank in soil	kg CO_{2e100}	$S_{oil\ GWP}$
Oxygen Safe	Photosynthetic Oxygen generated	O_2 kg CO_{2e100}	$O_{2\ GWP}$
Ozone Repair	Avoided ozone depleting chemicals	CFC_{11e} kg CO_{2e100}	$O_{3\ GWP}$
Hale Human Health Years (HALY)		HALY/capita	% HALY
Fresh Air	Oxygen free of particulates outdoors	kg O_2 @ C1750	$F_{resh\ Air}$
Clean Air	Oxygen free of NMVOCs indoors	IAQ	$C_{lean\ Air}$
Potable Water	Rain & potable water for hydration	m^3	W_{ater}
Nourishment	Accessible affordable fresh food	kJ	F_{ood}
Local Shelter	Household shelter Gross Floor Area	m^2	H_{oused}
Dignity of Work	>30hrs per week paid work	Weeks	J_{obs}
Positive Ecosystem Replenished Formation (PERF)		PERF/Ha@C1750	%PERF
Wildlife Safe	Wildlife corridors as refugia range	t Verge Biome	$W_{ild\ Verge}$
Terrestrial Stock	Terrestrial species richness & range	t Terra stock	$W_{ild\ Land}$
Aquatic Stock	Aquatic species richness & range	t Aquatic stock	$A_{qua\ stock}$
Marine Stock	Marine species richness & range	t Marine stock	$M_{ar\ stock}$
Urban Bounty	Area range & natural carrying capacity	t Urban biomass	$G_{reen\ Urban}$
Recreation Area	Area for 2 days pp week capacity	t R&R biomass	$R\&R_{space}$
Nature Reserve	Scarce reserves to full regeneration	t Reserve stock	$R_{egen\ Scarcity}$
Supply Energy & Resource Viability (SERV)		SERV/person km	%SERV
Viable Air	Airshed free of dust and chemicals	O_2 kg	O_{xygen}
Viable Water	Replenish locally accessible reservoirs	m^3 water	W_{ater}
Viable Food	Reliance on local fresh food kJ	kJ $_{food}$	F_{ood}
Viable Supply	Replenish accessible local resources	kg $_{feedstock}$	S_{upply}
Viable Fuel	Enhanced supply of renewable fuels	MJ $_{fuel\ renew}$	B_{iofuel}
Viable Mineral	Regeneration of mineral reserve stocks	MJ $_{Mineral}$	M_{ineral}
Viable First Aid	Accessible Paramedic & Medical Care	Minutes $_{to\ Aid}$	N_{urse}
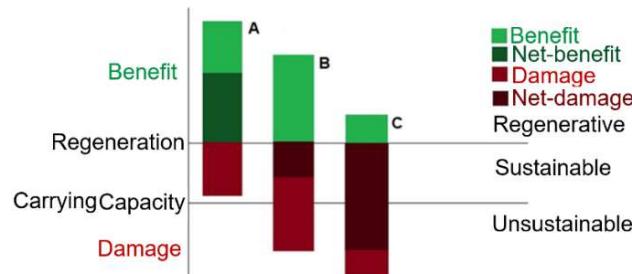
Figure 5. Charting progress from Unsustainable, Sustainable to Regenerative.

The authors find that improvement studies using LCIA focus on reducing damages as low as possible near zero. Whereas such studies using LCBA focus on system generation beyond zero of as much benefit as possible to facilitate regeneration. Here the LCA

system improvement focus should be on regeneration thresholds rather than carrying capacity.

For safety and to inspire hope rather than greenwashing, it is vital to show net and total damages along with net and total benefits. It is equally vital to clearly define if a flow is a benefit or avoided burden within or beyond a system boundary to avoid double-counting. In LCBA practice, as in real-world, science and logic, a damage or loss is a negative outcome and a benefit or gain is a positive outcome. In LCBA where benefits are designated positive signs representing gains in climate, human health, ecosystems and resource security and viability. This is the converse of conventional LCIA where damages are designated positive signs despite representing loss of climate, human health, ecosystems and resource security and viability.

In LCIA sequestered carbon is designated a negative emission flow irrespective of it producing biomass. LCA can become more balanced by supplementing LCIA with LCBA. Like banking systems counting both gains and loss, payments and earnings, savings and withdrawals, assets and loans, credits and debits, investments and returns, LCA needs to be capable of unbiased balanced counting.

6. Case studies

Three case study examples are used to show damages and benefits of durable

- US corn feedstock Polylactic Acid (PLA) polyester fibre non-woven in-wall thermal insulation;
- Queensland forest fibre particleboard sub-flooring installed in a base building;
- Victorian made chute for residential high-rise occupants to divert recyclables from garbage.

The studies are compliant with relevant ISO methodology. All input, output, product, burden and benefit shares throughout are allocated on their stoichiometric, biophysical and thermodynamic contributions. All system flows leaving at end-of-waste boundary are allocated as coproducts. Evah has also developed more advanced methods for durable biomass products carbon drawdown [32]. These factor on-site fuel use, fire history, prior land-use and service life [32,34-35].

6.1. Biopolymer case study

Polylactic Acid is a very common biopolymer made from corn, sugarcane or cassava. PLA's properties vary with glass transition and melt temperature comparable with Polyethylene Terephthalate (PET), Polypropylene (PP) and or Polystyrene (PS). During corn growing, the plant takes up carbon dioxide and converts some into sugars and then starch feedstock. Post-harvest, part of the carbon dioxide the corn sequestered remains in the roots as soil carbon. Factories make polylactide polymer from corn starch feedstock through continuous lactide polymerisation. Figure 1 depicts molecular changes from corn starch to a polylactide.
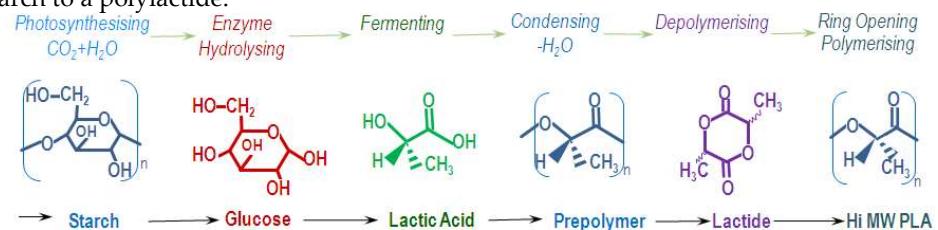
Figure 6. Starch, Glucose, Lactic Acid Lactide and Polylactide (PLA) Microstructures.

First water is removed in a continuous condensation reaction of aqueous lactic acid to produce low molecular weight prepolymer. Next, this is catalytically converted into the cyclic dimer lactide and vaporized. This lactide mix is then purified, via distillation and then melt crystallisation occurs. Finally high molecular weight PLA is produced by ring-

opening lactide polymerisation. Impurities are removed and meso lactide is separated by distillation [36]. The longer a PLA product is used, the longer its feedstock carbon is retained within. Built-in PLA polyester insulation remain in place as long as the building does so that carbon storage is a benefit from >20 to >100 years.

Evah modelled the global warming damage and climate braking benefit per m2 of PLA polyester insulation fabric blend of 91% dextrorotatory PLA (PDLA) 9% levorotatory PLA (PLLA). Most energy use in polyester fabric production is due to high spinning energy. The study compared insulation fabricated in South Korea (SK) + New South Wales (NSW) Australia, New Zealand South Island (NZSI) and Victoria (Vic) Australia. The Victorian grid is brown-coal-reliant, South New Zealand grid is hydro-reliant, and more typical South Korean and New South Wales grids are 10% to 30% renewable black-coal-reliant grids [37]. Table 2 show cradle to grave results for this insulation with negative damages and positive benefits.

Table 2. PLA insulation Global Warming Potential (GWP) Cradle to Gate (kg CO_{2eq100}).

PLA Insulation made in	KR+NSW	NZSI	Vic
GWP sequestered in PLA	4.9	4.9	4.9
Insulation fabrication	-6.8	-2.9	-11.8
Net damage	-1.9		
Net benefit		2.0	6.9

Energy type use was the most significant contributor to Global Warming Potential. SK and NSW made insulation emits more CO2eq than PLC biomass retains yielding a net damage total. However, because NZSI-made PLA insulation used mostly renewable power it has a net benefit.

6.2. Forest product case study

Like corn plants, trees also drawdown carbon, oxygen and hydrogen from air and photosynthesise these into carbohydrates to store as food, feedstock and structural fibre in trunks, roots and soil biome [32]. Carbon sequestered in paper and lumber is stored over the near-term fitout and long-term building life. Apart from remnant roots in soil, buildings can store ≤1.8kg of CO2/ kg lumber used [34-35]. Building with timber has many advantages for shock resistance, thermal insulation and pleasant indoor climate. Until the world reaches zero Carbon targets biomass deposits banked in built-in also offer time-critical climate braking opportunities to avoid imminent tipping points [32,34-35].

The Evah Institute method shows how to account for sequestered CO2 in LCA. All sequestered carbon is added as a gain only if durable lumber for a long-term application processed with renewable fuel grew in forests under plantation management for >100 years in reforesting countries lacking wild-fire loss. If any such condition is not or partly met then none or part qualifies [32]. Evah has carried out various timber LCAs including this particleboard example. Table 3 summarise gross negative damages and positive benefits of FSC certified 13kg/m2 particleboard flooring. This forest product was calculated to store 38kg CO2eq/m2. This carbon banking includes carbon left in ground soil and other retained feedstock not allocated to other co-products.

The fine root mass goes well beyond the drip line and far underground. Its carbon remains in that soil for >100 years even when the stump is torn out. These fine roots act as conduits across the forest supporting soil algal, microbial and fungal habitat and feed residual plants and trees throughout. Despite trunks being removed, the larger mass of relic autotrophic and chemotrophic synthesizers remains in the underground habitat. Their function is retained particularly for water supply and chemosynthesis by bacteria and fungi in synergy with algae fixing Nitrogen, Hydrogen Sulphur and Carbon to make compounds such as sugar and carbohydrate feedstock and structural fibres.

Table 3. Particleboard/m^2 Damages and Benefits Cradle to Grave.

Layer	Damage or Benefit	losses	gains	Unit
Climate	Ozone Depletion	-3E-08		kg CFC$_{11e}$
	Climate Brake near term		47	kg CO$_{2e20}$
	Climate Bank long term		38	kg CO$_{2e100}$
Habitat	Ecosystem Loss	-7E-05		m^{2}pa
	Forest Biomass Retain		452	MJ$_{NCV}$
People	Human Health Loss	-3E-04		HALY
	Hale Wellness		1E-4	DALY
Supply	Fossil Fuel Depletion	-12		MJ$_{NCV}$
	Mineral Depletion	-0.05		MJ$_{NCV}$
	Energy Renewal		75	MJ$_{NCV}$
	Matter Renewal		378	MJ$_{NCV}$

6.3. Garbage diverter case study

The high-rise residential building garbage chute with diverter studied allows house-holders to send garbage and recyclables to separate bins unlike other single chutes sending garbage to one bin. By making recycling easier, the diverter stimulates recycling rates. As individual recycling bins per unit are unnecessary this also avoids weekly elevator trips to take them out for collection. Unnecessary recycling bin rooms reduces one room per level which is a significant financial saving.

This Evah LCA modelled an 8-storey apartment building chute use by 128 occupants in 64 units, with and without a diverter, over 60 years. The literature showed typical residential recyclate material mix in Australia as well as 22% higher single dwelling recycling than high-rise rates [38-40]. Damages of garbage bin only and benefits of 22% higher recycling bin share use were modelled. Garbage to landfill impacts versus added diverted recycling feedstock gains were estimated. Similarly, occupied recycling bin room damages versus benefits accruing from unneeded rooms were modelled for a typical high-rise residential building cradle to gate.

Table 4 summarise garbage chute damages and benefits/m2 gross floor area (GFA) building with and without the diverter. Damages report negative outcomes. In all categories benefits with diverter were larger than damages without it. Overall gains were most significant.

Table 4. Garbage Diverter Damages Versus Benefits 60 years Cradle to Grave.

Viable	Security Benefits	Units	Chute	Space	Recycled	Gains
Climate	Climate Brake	kg CO$_{2e20}$	-1.0E5	1.0E5	4.0E6	4.0E6
Habitat	Habitat Regain	m^{2}pa	-0.4	0.1	35	35
People	Hale Wellness	years HALY	-6.8	0.9	457	451
Supply	Energy Recovery	MJ	-6.7E5	1.1E5	9.4E7	9.3E7

6.4. Building case study

Baggs et al describes the author's cradle to grave LCIA and LCBA of an Interpretive Centre Design for the Ekka showground in Brisbane, Queensland [11]. Its build mass comprised advanced glazing, local FSC forest products and organic biomass with e.g., im-

ported partly renewable ethylene tetrafluoroethylene (ETFE) Texlon roofing. While eutrophication called for mitigation in use to reach zero damages, no gross damage arose from

- Global warming forcing potential, stratospheric ozone loss or smog formation;
- Particulates, ecotoxicity, acidification, ionizing radiation;
- Depletion of freshwater, fossil fuel, minerals, elements or natural land use.

Nature positive asset benefits and gains outweighed all damages and loss. Annual Centre benefits/m^2 GFA cradle to grave included

- 30kl water renewal viable supply security;
- 27kg feedstock renewal viable supply security;
- 42kg CO_{2e20} climate braking near term to avoid imminent tipping points;
- 30kg CO_{2e100} climate bank long-term deposits in green wall and landscape fibre.

7. Discussion

While it is natural that people find bad news attractive it stresses and demotivates them. In addition to urban system damage assessment, it is vital to quantify benefits and gains to provide

- People hope about the future via positive news on verified quantitative benefits;
- Markets with information on product benefits as well as damages;
- Manufacturers a gain vs loss unbiased picture of whole of life systems;
- Purchasers decision-making support via unbiased whole of life gains vs loss declarations;
- Consumers verifiable evidence of products being Nature Positive;
- Industry encouragement to develop Nature Positive production systems;
- Opportunity to develop circular economy Nature Positive services;
- Service providers vision of benefits and gains reducing and offsetting damages and losses.

The paper shows how LCBA

- Reporting benefits may stimulate changed business strategies in a more positive way;
- Is a vital method to quantify viable climate, wellness, habitat and supply regeneration;
- Offers service providers insight to shape and contribute to regenerative outcome;
- May uncover strengths. weaknesses, threats and opportunity for positive development.

LCBA offers a way of

- Making damages more visible;
- Avoid greenwash to market products or services;
- Report net-benefits, real gains and positive outcomes;
- Reporting increased climate security.

8. Conclusions

In the real-world, science and logic, a damage or loss is a negative outcome or debt and a benefit, savings or gain is a positive outcome.

Like banking systems counting both gains and loss, LCA needs to be capable of unbiased accounting.

The authors have shown a systems life cycle method to quantify benefits and gains in climate, wellness, habitat and resource security of urban products and built systems.

LCBA offers vital ways to asses regeneration of viable climate, wellness, habitat and biodiversity which no other has the capacity to quantify at present. LCA should become less biased by supplementing LCIA with LCBA and designating positive signs to benefits representing gains in climate, human health, ecosystems and resource security and viability.

9. Recommendations

LCA practitioners should consider adopting and further developing LCBA as a vital method to quantify regeneration of viable climate, wellness, habitat and biodiversity for all stakeholders but specially to generate nature positive hope and inspiration in Extinction Rebellion children, youth and people everywhere.

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