

FLIP Co-Benefits Taxonomy

The FLIP Co-Benefits Taxonomy provides an index of FLIP co-benefits linked to climate actions. This chart, drawn from C40 Cities' Climate Action Impacts Taxonomy, identifies co-benefits of climate action that occur locally and are realized promptly following implementation. Expanding on C40's work, we have: 1) identified additional FLIP co-benefits that were not included in the original Framework, and; 2) suggested changes to existing categories, including the separation and expansion of the Health Impacts "Theme" from its original position as an "Impact Group" under "Social Impacts."



















All changes made to the table are delineated as follows (adapted from the C40 Taxonomy):

BOLD, ITALICS, & TEXT COLOR OF SECTOR = NEW CATEGORY CREATION

BOLD = CHANGED WORDING

BOLD & ITALICS = MOVED CATEGORY

In addition, the Taxonomy identifies case studies from the report that exemplify FLIP co-benefits within Themes and Impact Groups. These co-benefits are marked with specific icons that correspond to case studies as follows:

Case Studies	
 Agrivoltaics <i>Boulder, Colorado</i>	 Urban Greening <i>Freetown, Sierra Leone</i>
 Offshore Wind Farm <i>Block Island, Rhode Island</i>	 Mangrove Restoration <i>Demak, Indonesia</i>
 Community Solar <i>District of Columbia</i>	 Community-Centered Sustainable Forestry <i>Guatemala</i>
 Distributed Pumped Hydroelectric Storage <i>Manipur, India</i>	 Sustainable Urban Design <i>Barcelona, Spain</i>
 Building Retrofits <i>Madison, Wisconsin</i>	 Climate-Friendly Lunches <i>Oakland, California</i>
 Induction Cooking <i>Ecuador</i>	 Food Waste Recycling <i>South Korea</i>
 Net-Zero Buildings <i>Silver Spring, Maryland</i>	 Shade-Grown Coffee <i>Oaxaca, Mexico</i>
 Congestion Pricing <i>London, United Kingdom</i>	 Alternative Maritime Power® <i>Los Angeles, California</i>
 Cycling Infrastructure <i>Paris, France</i>	 Clean Construction <i>Oslo, Norway</i>
 Bus Rapid Transit <i>Mexico City, Mexico</i>	 Data Center Energy Conservation <i>Bibai, Japan</i>
 Bus Electrification <i>Santiago, Chile</i>	 Circular Economy <i>Kalundborg, Denmark</i>

HEALTH IMPACTS

IMPACT GROUP	IMPACT	FLIP BENEFIT	DESCRIPTION	CASE STUDIES
Physical & mental health	Resilience to disaster & weather-related hazards	Reduced health effects from extreme temperatures	Reduced adverse outcomes associated with extreme heat and other extreme temperatures, such as hospitalizations, mortality, negative mental health effects, and adverse birth outcomes. ²⁴	
		Reduced health effects from flooding	Reduced adverse outcomes from flooding, such as mortality and injury from drowning and physical hazards, water- and vector-borne diseases, negative mental health effects, and damage to critical infrastructure. ¹⁹³	
		Reduced health effects from other weather-related disasters	Reduced adverse outcomes from natural disasters (earthquakes, landslides, wildfires, droughts, hurricanes, and cyclones), such as injury and death due to physical hazards; adverse pulmonary, cardiovascular, and mental health outcomes; and food insecurity and sanitation-related harms. ¹⁹⁴	
		Reduced climate anxiety	Decreased mental health damages due to perceived threats of climate change. ¹⁹⁵	
	Social & behavioral health	Occupational health	Reduced mortality and injury from physical hazards in the workplace and decreased exposure to environmental hazards such as heat and chemicals.	
		Built environment improvements	Health and safety related improvements to the built environment, such as walkability, traffic-related injuries, physical and mental health benefits of greenspace access, and decreased exposure to extreme heat due to man-made structures or increase of tree canopy.	
		Socialization	Access to spaces that encourage socialization and are safe for independent child play.	
		Access to healthcare	Removes restricting physical or social boundaries, and prevents disruptions in patient access to healthcare that would otherwise lead to decreased treatment efficacy and adverse health outcomes.	
		Physical activity	Regular physical activity improves physical health outcomes – cardiovascular disease, cancer, diabetes, pediatric bone health and cognitive development – as well as mental health and overall well-being. ¹⁹⁶	
		Diet & nutrition	Healthy dietary habits protect against malnutrition and non-communicable diseases (NCDs) such as diabetes, heart disease, stroke, and cancer, and improve cognitive development. ¹⁹⁷	
		Food & Water Security	Reliable access to safe, nutritious food and clean water protects against malnutrition, waterborne illness, and non-communicable diseases, while supporting cognitive and physical development.	
	Environmental health	Reduced health effects from air pollution	Reduced adverse respiratory and cardiovascular outcomes, including chronic obstructive pulmonary disease (COPD), heart disease, stroke, and cancer, related to air pollution exposure, such as particulate matter (PM), ozone (O ₃), nitrous oxides (NO _x), and sulphur oxides (SO _x). ²⁵	
		Reduced health effects from water pollution	Reduced exposure to waterborne pathogens that cause illnesses such as cholera, giardia, and typhoid and chemical and metal contaminants, such as lead, arsenic, and nitrates, associated with adverse effects such as decreased brain function, hormone disruption, and cancer. ¹⁹⁹	
Reduced health effects from light pollution		Reduced exposure to artificial light at night that interrupts the circadian rhythm, decreasing sleep quality, associated with many disorders and diseases such as obesity, mental disorders, and cancer. ²⁰⁰		
Reduced health effects from noise pollution		Reduced exposure to noise pollution which in addition to hearing damages, is associated with cardiovascular disease, diabetes, and mental health and cognitive function decline. ²⁰¹		
Reduced health effects from poor Indoor Environmental Quality (IEQ)		Reduced exposure to indoor environmental hazards such as poor indoor air quality, physical hazards, and biological hazards which are associated with acute injury and illness, decreased cognitive function, and mental health effects. ²⁰²		
Reduced vectors and vector-borne disease		Habitat reduction of vectors such as mosquitos decreases risk of vector-borne disease spread.		

SOCIAL IMPACTS

IMPACT GROUP	IMPACT	FLIP BENEFIT	DESCRIPTION	CASE STUDIES
Quality of life and livability	Housing	Housing availability	Availability of decent and affordable housing to urban populations.	
		Housing quality	Size of the living area and quality of housing available.	
	Standard of living	City/neighborhood attractiveness	City's appeal through access to public spaces, aesthetics, and tourism.	
		Olfactory pollution	Decreases exposure to noxious smells causing discomfort, displeasure.	
		Rural development	Quality of life and economic well-being improvements for rural and peri-urban populations.	
		Electricity access	Access to reliable energy supply.	
		Access to greenspace	Availability of greenspace for all citizens' use and viewing .	
		Access to and quality of public services and design	Appeal through public services (transit, healthcare access) and urban design (ex: 15 min city).	
		Public safety	Protection against crime, accidents, and environmental hazards.	
		Work-life balance	Improved ability to balance work and personal life through reduced commute times, flexible schedules, supportive urban design, etc.	
Personal satisfaction		Increased subjective well-being and satisfaction with daily activities.		
Culture	Culture richness and heritage	Cultural diversity	Diversity of cultural activities to engage citizens.	
		Cultural heritage protection	Measures for and extent of cultural heritage protection.	
	Education	Education affordability	Cost of and access to education (public or private).	
		Education availability	Proximity to affordable educational institutions and resources.	
		Education quality	Provision of education and quality of instruction by trained staff.	
	Environmental & health awareness and behaviour	Waste education	Citizens' awareness and habits regarding waste (e.g., recycling, littering, composting).	
		Energy use education	Awareness of energy efficiency and household energy use.	
		Water use education	Awareness and habits related to efficient water use.	
		Hygiene and sanitation education	Habits related to handwashing, sanitation, and hygiene.	
		Travel behaviour	Habits and awareness related to transportation mode choices.	
		Sex education	Awareness of family planning and sexual health.	
		Food consumption and diet education	Awareness of food choices, nutrition, and their impacts.	
		Other sustainability education	Awareness and habits of other activities related to environmental responsibility, resource conservation, and long-term ecological wellbeing.	
Institutions	Community empowerment	Civic participation	Citizens' participation in civic and climate-related actions.	
		Community cohesion	Sense of belonging and solidarity in local communities.	
		Decreased out-migration	Lower migration rates due to improved living conditions, economic opportunity, or safety.	
	Equity and inclusivity	Equitable access	Inclusion of diverse groups in social benefits, the job market, and policy-making.	
		Justice	Fairness, impartiality, and independence of legal systems.	
		Environmental justice	Ensure community members have equal protection from environmental harms and equal access to environmental benefits.	
		Gender equity	Justice in treatment of all genders through policies, workshops, and/or resource allocation.	
	Good governance	Local democracy	Democratic principles and citizen participation.	
		Evidence-based policy-making	Use of tools and data for informed decision-making.	
		Creative governance	Innovative approaches used in policy-making to address complex climate and societal challenges.	
		Community engagement	Increased role of local community groups in planning and implementation of programs.	
		Catalyst for further policy/action	Success of the program inspired similar programs or action.	
	Transparency and accountability	Transparency in institutions, accountability, and anti-corruption.		

ECONOMIC IMPACTS

IMPACT GROUP	IMPACT	FLIP BENEFIT	DESCRIPTION	CASE STUDIES
System & business-level economics	Economic output	Local economic production	Local income from increase in production/consumption of goods and services.	
		Business profitability	Reduced business expenses and/or increased revenue for businesses.	
		Labour productivity	Production and value-added from jobs and working time.	
	Employment	Job creation	Job creation in existing sectors.	
		Earnings quality	Quality and stability of employee earnings.	
		Job security	Reduced risk of job loss.	
		Workforce development/ technical training	Strategies and programs that build workers' skills to meet current and future labor market needs.	
	Economic security	Energy security	Increased grid reliability/resilience.	
		Infrastructure improvements	Upgrades or enhancements to physical systems (such as transportation, energy, water, and communication networks).	
		Self-sufficiency	Ability of an individual, community, or economy to meet its own needs (ex: food, energy, or essential goods).	
		Climate resiliency	Actions that protect individuals and organizations from economic losses associated with weather-related hazards.	
		Support of small businesses	Policies, programs, or infrastructure that improve stability, revenue, and viability for small and local enterprises.	
	Economic innovation, dynamism, and competitiveness	Innovation	New product or service creation, research and development activity. Decreased barrier to entry for further projects.	
		Local sector development and new industries	Emergence of new industries and businesses.	
	Public budget	Available municipal budget	City government budget for policies and programs.	
		Available regional/ state budget	Regional or state-level budgets.	
		Tax revenue	Income from taxation.	
		Non-tax revenue	Government income from non-tax sources.	
		Reduced government social spending	Reduces costs borne by the government for the delivery of essential services such as healthcare and emergency response.	
	Household-level economics	Private wealth	Housing & energy affordability	Decreases cost of housing and energy to urban populations relative to income.
Value of assets			<i>Household asset accumulation and net worth.</i>	
Economic empowerment		Ability to afford goods/services and build savings.		

ENVIRONMENTAL IMPACTS

IMPACT GROUP	IMPACT	FLIP BENEFIT	DESCRIPTION	CASE STUDIES
Environmental quality	Biodiversity	Biodiversity protection	Protection of ecosystems and habitats.	
		Ecosystem services	Improves value of benefits provided by ecosystems.	
		Biological diversity	Increases variety and variability of living organisms.	
		Species population	Increases health and size of species populations.	
	Air quality	Indoor air pollution	Improves air quality inside buildings.	
		Outdoor air pollution	Improves ambient air quality, including improved visibility from reduced haze.	
	Noise pollution	Indoor noise	Decreases noise exposure inside homes and buildings.	
		Outdoor noise	Decreases noise exposure from traffic and urban activity.	
	Quality of land	Soil pollution	Decreases soil contamination from chemicals and waste.	
		Soil health	Improves soil health and productivity.	
		Soil texture	Improves composition and granularity of soil and improves its stability, decreasing erosion.	
		Land subsidence	Prevents the gradual sinking or sudden collapse of the ground surface.	
	Light pollution	Sky glow	Prevents the brightening of the night sky.	
		Light intrusion or trespass	Prevents unwanted artificial light from entering spaces.	
		Glare	Decreases visual discomfort caused by excessive brightness.	
	Water quality	Water pollution	Decreases presence of harmful chemical and biological pollutants in water.	
		Water salinisation or acidification	Prevents harmful salt and pH changes in water bodies.	
		Eutrophication	Reduced nutrient enrichment in bodies of water which would often lead to algal blooms, depleting oxygen levels which reduces water quality and harms aquatic populations.	
		Water temperature	Effects of temperature on water quality/ecosystems.	
		Water treatment	Municipal actions affecting water potability and sanitation.	
	Temperature	Indoor air temperature	Indoor heat and energy demand.	
		Outdoor air temperature	Urban heat island effect (affected by greenspace and surface materials), heat resilient infrastructure.	
	Resource management	Natural resources conservation	Decreased rate of depletion of renewable and nonrenewable resources.	
		Waste production and management	Waste generation and disposal practices.	