Physical Activity: Park, Trail, Greenway Infrastructure Interventions

Summary Evidence Tables – Systematic Economic Review

This table outlines information from the studies included in the Community Guide economic review of park, trail, and infrastructure interventions to increase physical activity. It details study design and economic analysis, population and intervention characteristics, and economic outcomes considered in this review. Complete references for each study can be found in the Included Studies section of the review summary for Park, Trail, and Greenway Infrastructure Interventions when Implemented Alone or Park, Trail, and Greenway Infrastructure Interventions when Combined with Additional Interventions.

Abbreviations Used in This Document:

- Economic outcomes:
  - DALY, disability-adjusted life year
- Measurement terms:
  - Ha, hectares
  - WTP, willingness to pay
- Other terms:
  - USDOT, United States Department of Transportation

Notes:

Quality of economic estimates – Studies are assessed to be of good, fair, or limited quality. This valuation is based on two domains: Quality of Capture, and Quality of Measurement.

Race/ethnicity of the study population: The Community Guide only summarizes race/ethnicity for studies conducted in the United States.

Physical Activity

Study Information	Study and Population Characteristics	Trial Name Intervention & Comparison	Intervention Costs	Intervention Benefits	Economic Summary Measure
Author (Year): Alfranca et al. (2011) **Design:** Modeled **Economic Method:** Cost-Benefit **Funding Source:** Project - Granollers City Council Study – NR **Monetary Values:** Reported in 2006 Euro Conversion Factor to 2021 U.S. dollars: 1.70	**Location:** Granollers, Catalonia, Spain **Population:** Based on residents and 17,760 visitors from June 2006 to January 2007 (8 months). **Characteristics:** Age: <14 years 11%; 14-25 years 15%; 25-50 years 61%; >50years 13% Females: 26% **Time Horizon:** Project completed in 2003. Data from 2006-2007. Modeled over 20 years. Discount rate not reported.	**Intervention:** Creation of a wetland within an existing peri-urban park using wastewater from treatment facility. Wetland area was 1 ha and park was 8 ha. Most visitors used the park for sporting activities (e.g., jogging, walking, and biking), and less for traditional activities such as picnicking. **Comparison:** No intervention	**Intervention cost:** Capital cost €90,900 and annual maintenance and operation of €20,350. Authors note small capital cost relative to operation and maintenance. Translated to 0.54 euro per cubic meter of treated water. **Components:** Construction, land, operations, maintenance. **Source:** NR **Quality:** Good	**Total Benefits:** €89,910 annually €1.25 per cubic meter of treated water, assuming 48000 cubic meters of wastewater reclaimed over 8 months. **Components:** Recreation benefits **Source:** Travel cost for recreation benefits derived from City Council 2006 and 2007 reports on wetland and park users, modes of arrival, and purpose of visit. **Benefits Method:** Recreation benefit value is estimated as wages foregone during time to reach the site and time spent in site. **Quality:** Fair	**Cost Benefit Ratio:** 3.4 (=€1,427,544/ €414,006 over 20 years). **Quality:** Fair
Author (Year): Atlanta BeltLine, Inc. (2020) **Design:** Modeled **Economic Method:**	**Location:** Atlanta, Georgia, USA **Population:** Residents: 5,119 within 0 – 400 meters; 5,736 within	**Intervention:** Extension of Atlanta Beltline project in southside Atlanta; rails-to-trails is a substantial component. The project includes the design of a 14-feet concrete, multi-use path that extends	**Intervention cost:** $55.08 million over 30 years **Components:** Capital cost of $69.8 million during 2021-2024: scoping and	**Total Benefits:** $161.5 million **Components:** Composed of $114.2 million for value of pedestrian and biker recreation; $4.3 million for health benefit (healthcare cost averted); $22.3 million in pedestrian, biker,	**Cost Benefit Ratio:** 2.93 (=161.5/55.08 million over 30 years) **Quality:** Good

Study Information	Study and Population Characteristics	Trial Name Intervention & Comparison	Intervention Costs	Intervention Benefits	Economic Summary Measure
Cost-Benefit **Funding Source:** Project – City of Atlanta, U.S. Department of Transportation Study – NR **Monetary Values:** Reported in 2018 U.S. dollars Conversion Factor to 2021 U.S. dollars: 1.08	400 – 800 meters; and 17,621 residents within 800 – 1,600 meters of the project. **Characteristics:** Low socioeconomic status **Time Horizon:** Proposed in May 2021; first of five project segments completed in September 2021. Modeled over 30 years. Discount rate 7%.	approximately 3.1 miles. Additional elements include planting, lighting, retaining walls, vertical connections to adjoining streets, storm drainage, signage/ wayfinding, and the replacement and rehabilitation of several bridges. The design also includes streetscape/ accessibility improvements on all intersecting streets extending from the corridor to the nearest intersection or one-quarter mile, whichever was closest. **Comparison:** No intervention	engineering $6.4 million; right of way $10.6 million; utility relocation $1.7 million; construction $51 million; 30-year operations and management $5 million. **Source:** Technical proposal for grant. Maintenance costs from city records related to existing trail segments. **Quality:** Good	vehicle crash cost averted; $0.124 million in emission reduction; $20.5 million increase in property value of single-family residences in 0.5-mile buffer. **Source:** Benefits computed using local statistics and estimates of effects from literature. **Benefits Method:** Recreational value of new pedestrian and bicyclists extrapolated from observed effects in the completed west and east trails to the catchment population in proximity of southside trail following USDOT guidelines. Health benefits used NCHRP 552 Report for new bikers and pedestrians at reduced healthcare cost of $177 per user, based on median of 10 studies. Pedestrian, bike, and vehicular injuries valued based on USDOT guidelines from actual crash data in southside and reductions observed in the west and east trails. Values for nitrogen oxides and carbon emission reductions drawn from USDOT guidelines and reduced vehicle trips. Increase in property value for single-family residences in 0.5-mile buffer based on Fulton County 2019 property tax data. **Quality:** Good	
Author (Year): Dallat et al. (2014)	**Location:**	**Intervention:** Trails and paths for walking/cycling (19 kms)	**Intervention cost:**	**Scenarios assumed for catchment population:**	**Cost per DALY averted over 41 years:**

Study Information	Study and Population Characteristics	Trial Name Intervention & Comparison	Intervention Costs	Intervention Benefits	Economic Summary Measure
Design: Modeled **Economic Method:** Cost per DALY **Funding Source:** Project – City of Belfast, Big Lottery Living Landmarks Study – UK Centre of Excellence for Public Health UKCRC. HRB/HSC R&D/NCI Health Economics Fellowship. Numerous government agencies and foundations. **Monetary Values:** Reported in 2009 UK pounds Conversion Factor to 2021 U.S. dollars: 1.62	Belfast, Northern Ireland, United Kingdom **Population:** 110,600 residents within vicinity of the greenway, and 87,500 residents in centroid within a 1-mile radius. 1,209 residents surveyed. **Characteristics:** Age: 16–24 years 7%; 25–44 years 36%; 45–64 years 30%; 65+ years 27% Females: 59% Economically inactive: 49% Most deprived: 18% Least deprived: 37% **Time Horizon:** Project started in 2010 and completed in 2016. Modeled over 41 years. Discount rate 3.5%.	and greenspace created along a linear greenway (9 kms) as part of an urban regeneration project. **Comparison:** No intervention	Total cost of £6,857,811 over 41 years. (£5,531,175 for construction and £1,326,636 for 41-year discounted cost of maintenance and replacement). **Components:** Construction, maintenance **Source:** Data from construction company **Quality:** Good	Scenario A (2% become active), Scenario B (5% become active), Scenario C (10% become active). **Healthcare cost savings over 41 years:** Scenario A: £211,811 Scenario B: £481,179 Scenario C: £946,088 **Disability-adjusted life years (DALY) averted over 41 years** Scenario A: 361 Scenario B: 722 Scenario C: 1323 **Components:** Healthcare cost, DALY **Source:** Costs from national data and studies on prevalence and cost to treat each disease. Risk of disease from published systematic reviews and meta-analyses. Baseline physical activity of area residents from survey. DALY lived calculated based on diseases prevented. DALY estimates used weights from the Global Burden of Disease study. **Benefits Method:** Effect of project on physical activity based on two European studies that showed 3.1 to 6.8 minutes per day of moderate to vigorous physical activity, which would be 7% and 10% of residents becoming active	(=Intervention cost - healthcare cost savings)/DALY averted Scenario A: £18,411, Scenario B: £8830 Scenario C: £4469 **Quality:** Fair

Study Information	Study and Population Characteristics	Trial Name Intervention & Comparison	Intervention Costs	Intervention Benefits	Economic Summary Measure
				based on results of baseline survey of greenway residents. Healthcare cost savings from averted colon cancer, breast cancer, ischemic heart disease, stroke. **Quality:** Fair	
Author (Year): Hunter et al. (2020) **Design:** Modeled **Economic Method:** Cost-Benefit **Funding Source:** Project – City of Belfast, Big Lottery Living Landmarks Study –Numerous UK government agencies and foundations **Monetary Values:** Reported in 2014 UK pounds Conversion Factor to 2021 U.S. dollars: 1.43	**Location:** Belfast, Northern Ireland, United Kingdom **Population:** 110,600 residents within vicinity of the greenway, and 87,500 residents in centroid within a 1-mile radius. **Characteristics:** Age: 16–24 years 7%; 25–44 years 36%; 45–64 years 30%; 65+ years 27% Females: 59% Economically inactive: 49% Most deprived: 18% Least deprived: 37% **Time Horizon:** Project started in 2010 and completed in 2016. Modeled	**Intervention:** Trails and paths for walking/cycling (19 kms) and greenspace created along a linear greenway (9 kms) as part of an urban regeneration project. **Comparison:** No intervention	**Intervention cost:** Total cost of £35 million **Components:** NR **Source:** NR **Quality:** Fair	**Total Benefits:** Worst-case: £100.7 million Best-case: £203.5 million Worst and best cases over 40 years based on various input values and discount rates. **Components:** Property value £970,857 for properties within 50 meters of greenway; flood damage through flood alleviation £42 million; environmental pollution £9 million; health savings £211,811, £481,179, and £946,088 for 2%, 5%, and 10% becoming active; value of lives saved of UK pounds £11.7 million, £27.8 million, and £51.2 million for 2%, 5%, and 10% becoming active; labor productivity £2.8 million; quality of place (reduced crime) £ 33.6 million; tourism (visits to parks WTP and cost) range from £270,135 to £496,700. **Source:** Property value based on UK and U.S. studies. Healthcare cost savings using PREVENT tool. Pollution and flood abatement based on London study. Effect of project on physical activity based on two	**Cost-Benefit Ratio:** Worst-case: 2.88 Best-case: 5.81 **Quality:** Fair

Study Information	Study and Population Characteristics	Trial Name Intervention & Comparison	Intervention Costs	Intervention Benefits	Economic Summary Measure
	over 40 years. Discount rate 3.5%.			European studies and results of baseline survey of greenway residents. Area employer data for productivity. WTP studies from UK for tourism value. **Methods:** Property value increase of 2%, 5%, 10% for properties 50 meters, 450 meters, 800 meters from greenway based on local conditions and review of US and UK studies. Flood damage, environmental pollution through reduced motor vehicle use based on London survey of travel and local traffic counts and UK Transport Department value of pollutants avoided by reduced car travel. Healthcare cost savings using PREVENT model for colon cancer, breast cancer, ischemic heart disease, and stroke and cost of treatment from UK national data assuming 2%, 5%, and 10% become active. Productivity from reduced absenteeism among three major area employers. Quality of place through reduced crime assuming 21% decrease in crime and valued at UK cost of the crimes. Tourism based on WTP study for Ireland and study for Great Britain for trips to parks. Benefits sustained over 40-year life of park. **Quality:** Good	
Author (Year): Lockwood et al. (1995)	**Location:** Sydney, Australia **Population:**	**Intervention:** Centennial Park in Sydney, Australia. Existing park and facilities with sculpted	**Intervention cost:** AUS$6 million per annum	**Total Benefits:** Annual use value of AUS$23 million and AUS$33 million from travel cost survey. At least AUS$2.6 million per annum from non-	**Cost-Benefit Ratio:** 4.3

Study Information	Study and Population Characteristics	Trial Name Intervention & Comparison	Intervention Costs	Intervention Benefits	Economic Summary Measure
Design: Modeled **Economic Method:** Cost-benefit without capital cost **Funding Source:** Project – existing facilities Study – Centennial Park and Moore Park trust **Monetary Values:** Reported in 1993 Australian dollars Conversion Factor to 2021 U.S. dollars: 1.36	Assumed number of households: 1,188,685 and 3 million visitors in 1992. **Characteristics:** NR **Time Horizon:** Existing infrastructure. Analysis is annual.	gardens, ornamental wetlands, sports fields, and more natural areas. Total area of 220 ha. **Comparison:** No park	**Components:** Maintenance and management **Source:** NR **Quality:** Fair	use value based on contingent valuation survey. **Components:** Use value and non-use value **Source:** Onsite survey of users to determine travel cost. Offsite survey to determine contingent valuation. **Methods:** Travel cost and contingent valuation **Quality:** Fair	(=AUS$23 million + AUS$2.6 million)/AUS$6 million **Quality:** Fair
Author (Year): Machac et al. (2018) **Design:** Modeled **Economic Method:** Cost-Benefit **Funding Source:** Project – NR Study – Technology Agency of the Czech Republic	**Location:** Brno, Czech Republic **Population:** 11,500 in district (Novy Liskovec) **Characteristics:** Age: > 65 years 9%. Households with children: 33%. Single person households: 28%	**Intervention:** Park and wetland in dense residential Novy Liskovec district of Brno, Czech Republic. Wetland created from rainwater from residential roofs. Note this is an ex-post evaluation of a completed project. Total area was 32 ha. **Comparison:** No intervention	**Intervention cost:** Construction: €410,997 Land acquisition: €3.5 million Operations: €15,200 annually **Components:** Construction, land acquisition, maintenance **Source:**	**Total benefits:** €26.6 million (25 years) €36.2 million (50 years) **Components:** Property value €1,098,480; annual benefit of water retention, air quality, CO reduction €791; benefit from recreation and aesthetics, water quality, and biodiversity €1,639,030 **Source:**	**Cost-Benefit Ratio** 25-year horizon: 6.5 (=€26.6 million/€4.1 million) 50-year horizon: 8.6 (=€36.2 million/€4.2 million) **Quality:** Good

Study Information	Study and Population Characteristics	Trial Name Intervention & Comparison	Intervention Costs	Intervention Benefits	Economic Summary Measure
Monetary Values: Assumed reported in 2015 Euros Conversion Factor to 2021 U.S. dollars: 1.08	**Time Horizon:** Project completed around 2011. Modeled over 25 and 50 years. Discount rate not reported.		Infrastructure cost data from district council and project architects. Operating costs from previous projects and catalogs and verified by council and architects. **Quality:** Good	Tax revenue maps of properties. Meta-analysis for other benefits of wetlands. Meta-analysis for other benefits of parks. **Methods:** Meta-analyses included recreation and aesthetic benefits, water quality, and biodiversity. Values adjusted to local context. Values for water retention, air quality, and CO2 reduction based on primary local data and analyses. **Quality:** Good	
Author (Year): Mekala et al. (2015) **Design:** Modeled **Economic Method:** Cost-Benefit **Funding Source:** Project – Australian Government, Department of Environment, Land, Water and Planning, Melbourne Water, City West Water, Development Victoria, Brimbank council.	**Location:** Melbourne, Australia **Population:** 973 households are direct beneficiaries. 2837 residents in 1-mile radius of project. **Characteristics:** Age: <5 years 5%; <18 years 20%; > 65 18% Unemployed: 12.4% Low income less than AUS $600 per week: 29% Physically inactive: 44%	**Intervention:** Rehabilitation of 1.23 kilometers of creek in City of Brimbank, Melbourne, Australia transforming from a concrete lined solution for flooding problems to a natural waterway. Priorities for community identified as lack of greenspace, paths and space for walking, bicycling, and sports. Work started in 2016 and original plan to remove the concrete lining was abandoned on discovery of asbestos contamination. Site remediation completed in 2019. Construction,	**Intervention cost:** Construction and demolition AU$11 million. Annual maintenance AU$10,000 Unexpected asbestos remediation was AU$5 million. **Components:** Construction, maintenance, remediation **Source:** NR **Quality:** Good	**Total Benefits:** One time property value increase: AU$3,900,000 Annual benefit flow of around AU$105,005 **Components:** Property value one-time increment of AU$3.9 million; averted healthcare cost from physical activity ranged from AU$75,049 (10% become active) to AU$112,574 (15% become active) annually; benefit of park visits AU$9,380 annually; carbon sequestration AU$950 to AU$2,677 annually. **Source:** Median prices from area real estate data. Benefit of park visit by benefit transfer from Spanish study of WTP for park visit. Cost of inactivity based on Australian study	**Cost-Benefit Ratio:** 0.59 Total cost of AU$11.3 million and total benefits of AU$6.6 million over 50 years, computed by reviewers. **Quality:** Good

Study Information	Study and Population Characteristics	Trial Name Intervention & Comparison	Intervention Costs	Intervention Benefits	Economic Summary Measure
Study – Australian Commonwealth's Collaborative Research Network Program and Australian Commonwealth's Scientific and Industrial Research Organisation. **Monetary Values:** Assumed reported in 2011 Australian dollars Conversion Factor to 2021 U.S. dollars: 1.14	Work commute by car: 70% Vulnerable (young and old) to extreme heat: 23% **Time Horizon:** Began in 2016. Stalled in 2018. Partial completion in 2020. Modeled by reviewers over 50 years with 3% discount rate.	planting, and landscaping completed in 2020. **Comparison:** No intervention		for cost of inactivity. Value of carbon sequestered based on Australian national and regional studies. **Methods:** Property value increase assessed for houses in 500-meter radius of project. Used Adelaide study results to determine price increase by distance from project. Assumed 50.4% adults would visit park based on Victorian study. Baseline physical inactivity based on area social health atlas. Assumed 10%, 12%, and 15% becoming active in catchment area. The effect of 4,000 tree plantings used to determine carbon sequestration. **Quality:** Good	
Author (Year): Reynaud et al. (2017) **Design:** Modeled **Economic Method:** Cost-Benefit **Funding Source:** Project – Lombardy Regional Authority and co-funding by Fondazione Cariplo	**Location:** Gorla Maggiore, Lombardy, Italy **Population:** Households in Gorla Maggiore: 2045. Households in Gorla Maggiore plus 2 adjacent municipalities: 6907. **Characteristics:** Age>18 years: 51.5%	**Intervention:** Green infrastructure dedicated to water pollution removal and flood risk management. Park is 600 meters from Gorla Maggiore. Park component includes restored riparian trees, open green space, walking and cycling paths, and facilities. Park is 4.5 ha within the total area of 6.5 ha.	**Intervention cost:** Construction: Scenario P1: €900,000 Scenario P2: €820,000 Scenario P3: €844,700 Scenario P4: €794,700 Annual Maintenance Scenario P1: €3,600 Scenario P2: €2,600 Scenario P3: €15,400 Scenario P4: €11,800 **Components:**	**Total Benefits** Unadjusted willingness to pay per household per year Scenario P1: €28,190 Scenario P2: €10,150 Scenario P3: €5,880 Scenario P4: €3,500 Econometrically adjusted willingness to pay per household Scenario P1: €28,200 Scenario P2: €10,200 Scenario P3: €5,900 Scenario P4: €3,500	**Benefit ratio for households in Gorla Maggiore plus 2 adjacent municipalities** Strategy P1: 3.12 (=€2,984,730/ €955,166) Head-to-head comparison of scenario P1 versus scenario P4 indicates

Study Information	Study and Population Characteristics	Trial Name Intervention & Comparison	Intervention Costs	Intervention Benefits	Economic Summary Measure
Study – European Union's Seventh Programme for Research, Technological Development and Demonstration **Monetary Values:** Assumed reported in 2012 Euros Conversion Factor to 2021 U.S. dollars: 1.18	Female: 50.2% Economically active: 53.8% **Time Horizon:** Project during 2011-2012. Modeled over 20 years. Discount rate 2%, 3%, and 4%.	Project on a previous poplar plantation along a river. Municipality operates a combined sewer network that collects rainwater, domestic sewage, and industrial wastewater in same pipelines. Existing wastewater treatment plant discharges into river. Scenarios considered are: P1 wetland and park; P2 wetland and poplar plantation; P3 conventional infrastructure and park; P4 conventional infrastructure and poplar plantation **Comparison:** 4 scenarios described above	Construction and maintenance **Source:** Data from construction and engineering firm that constructed the park **Quality:** Good	**Components:** Household willingness to pay **Source:** Household survey **Methods:** Survey of households for willingness to pay for each of 4 described scenarios. Attributes for which WTP solicited based on descriptions were pollution reduction, flood control, biodiversity, recreation. **Quality:** Fair	scenario P1 costs less and produces more benefits. **Quality:** Fair **Notes:** The adjacent municipalities have access to the park