

Return on Conservation™ Index: Hill Country Alliance (HCA) Night Sky Program

*For more info on how to read this card and metadata associated with it, please visit texanbynature.org/roc-index

HCA's [Night Sky Program](#) helps counties and cities minimize the impacts of light pollution through education and outreach, business and neighborhood recognition programs, the establishment of outdoor lighting policies, and the celebration of starry night skies across the Hill Country. HCA engages with over 200 local partners through the Night Sky Team – a collaborative group of key personnel in more than 30 Hill Country communities, state and local parks, conservation organizations, formal and informal educators, chambers of commerce, and volunteer-led Friends groups. Counties include: Bandera, Bexar, Blanco, Burnet, Comal, Edwards, Gillespie, Hays, Kendall, Kerr, Kimble, Llano, Mason, Medina, Real, Travis, and Uvalde.





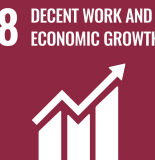



This ROC™ Index outlines the benefits of preserving dark night skies in the Hill Country.

SUSTAINABLE DEVELOPMENT GOALS	Targets	Impact 2013-2023	Total Economic Value <i>Opportunistic</i>
3 GOOD HEALTH AND WELL-BEING 	3.4: Promote mental health and well-being	3.8M+ Hill Country residents benefit from decreased light pollution	\$27M in avoided health care burden due to poor sleep ¹
4 QUALITY EDUCATION 	4.7: Ensure all learners have the knowledge and skills to promote sustainable development through education	45,300 people educated about the impacts of light pollution and how to adopt night sky best practices	\$42K value of education from nature-based activities
7 AFFORDABLE AND CLEAN ENERGY 	7.3: Double the global rate of improvement in energy efficiency	Potential to save 300M kWh/year through the adoption of night sky best practices	\$38M cost savings of implementing night sky-friendly lighting ²
8 DECENT WORK AND ECONOMIC GROWTH 	8.9: Devise and implement policies to promote sustainable tourism	1,000+ star party events hosted at Texas State Parks over the past 10 years	\$208K value of stargazing and astrotourism
11 SUSTAINABLE CITIES AND COMMUNITIES 	11.B: Increase cities adopting and implementing policies towards inclusion, resource efficiency, mitigation and adaptation to climate change, and resilience to disasters	29 municipalities across 17 counties have adopted outdoor lighting ordinances	Not Yet Valued
13 CLIMATE ACTION 	13.2: Integrate climate change measures into national policies, strategies and planning	Decreased electricity use has the potential to save 1.54M tons of CO2 each year	\$7M social cost of carbon and nitrous oxide avoided by reduction of outdoor light
17 PARTNERSHIPS FOR THE GOALS 	17.19: Develop measurements of progress on sustainable development that complement gross domestic product	1 Return on Conservation™ Index	Not Yet Valued

Key Assumptions and Caveats:
¹ No local epidemiological study has been deployed to confirm the true baseline health status of the population in question and it is suggested that deeper stakeholder engagements validate key health assumptions made in these estimates.
² Assumes the adoption rate of residential sustainable lighting practices is 100% as these practices are to be city/county ordinance-enforced.
³ While local companies are reached with awareness and educational materials, without a formal monitoring program, it is difficult to quantify how many of those companies reached actually deploy the sustainable practices and to what extent.

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	Targets	Reporting Standards	How HCA Addresses Sustainable Development Goals
	3.4: Promote mental health and well-being	WHO Global Health Observatory Indicator: Policy or plan for mental health	- Over 3.8 million Hill Country residents benefit from decreased light pollution. <i>No local epidemiological study has been deployed to confirm the true baseline health status of the population in question and it is suggested that deeper stakeholder engagements validate key health assumptions made in these estimates.</i>
	4.7: Ensure all learners have the knowledge and skills to promote sustainable development through education	GRI G4-EO11: Number, type and impact of sustainability initiatives designed to raise awareness, share knowledge and impact behavior change, and results achieved	- The adoption of outdoor lighting ordinances has educated 75,000+ people about the impacts of light pollution and how to adopt night sky best practices. 45,300 of those people received hands-on education through outdoor star parties at Texas State Parks.
	7.3: Double the global rate of improvement in energy efficiency	GRI G4 Sustainability Reporting Guidelines: Reduction of energy consumption	- Potential to save 300 Million kilowatt-hours (kWh) per year through adoption of night sky best practices. (The average house with poorly designed outdoor lighting wastes 0.5 kWh per night, there are approx. 1,647,310 households in the Hill Country region = 823,655 kWh/night = 300 M kWh/year).
	8.9: Devise and implement policies to promote sustainable tourism	Indicator 8.9.1: Tourism direct GDP as a proportion of total GDP and in growth rate	- 1,000+ Night Sky Events held at Hill Country Texas State Parks over the past 10 years, hosted by 7 different Hill Country astronomy clubs and societies.
	11.B: Increase cities adopting and implementing policies towards inclusion, resource efficiency, mitigation and adaptation to climate change, and resilience to disasters	Indicator 11.b.2: Proportion of local governments that adopt and implement local disaster risk reduction strategies	- 29 municipalities across 17 counties have adopted outdoor lighting ordinances and 49 "night sky-friendly" businesses³ have acted on night sky recommendations and practices. 14 county night sky resolutions have been adopted by cities, counties, utilities, and businesses across the hill country. These ordinances and resolutions are indicators of the importance of night sky preservation and are a positive show of support for the issue.
	13.2: Integrate climate change measures into national policies, strategies and planning	Indicator 13.2.2: Total greenhouse gas emissions per year	- Potential to save approximately 1.54 million tons of CO2 each year from improper outdoor lighting in Texas. (30% of all outdoor lighting in US is wasted = \$3.3 billion, approx \$10 per year for every man, woman, and child in the US = approx \$256 million in Texas).
	17.19: Develop measurements of progress on sustainable development that complement gross domestic product	GRI General Indicators: - Publicly disclosing sustainability information and increasing accountability and transparency - Advocating for the disclosure and use of sustainable development data	Hill Country Alliance and Texan by Nature worked together to report the environmental and economic return on investment of the adoption of night sky best practices to promote participation in and investment from private and public sectors. Texan by Nature ROC™ Indexes are used to aid organizations in articulating the quantitative impact of their efforts, for standardized reporting, fundraising, development, and more.

ROC™ INDEX CREATED BY:









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*Resources used to create report card: [UN SDG Compass](#), [Global Reporting Initiative](#), [UN SDG Stats Metadata](#)
 *Please see the appended methodologies section for more information on proxy use and caveats of the analysis.

Return on Conservation™ Index: Economic Proxy Use

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UN SDG GOAL	Proxies Used	Unit of Measure	Proxy Explainer	Citation
 <p>3 GOOD HEALTH AND WELL-BEING</p>	Healthcare Savings No local epidemiological study has been deployed to confirm the true baseline health status of the population in question and it is suggested that deeper stakeholder engagements validate key health assumptions made in these estimates.	\$/person/year	<p>Thought Exercise:</p> <p>3.8 M residents benefit from reduced light pollution in the Hill Country. Circadian rhythm profoundly affects sleep, and circadian rhythm is profoundly affected by light pollution.</p> <p>According to the CDC (USDHHS, 2022), 1/3 of Americans have poor sleep. Assuming half of these residents are working adults and that 1% of the population is chronically affected by poor sleep caused by light pollution.</p>	<p>Grandner M. A. (2018). The Cost of Sleep Lost: Implications for Health, Performance, and the Bottom Line. American journal of health promotion : AJHP, 32(7), 1629–1634.</p> <p>Rosekind, M. R., Gregory, K. B., Mallis, M. M., Brandt, S. L., Seal, B., & Lerner, D. (2010). The Cost of Poor Sleep: Workplace Productivity Loss and Associated Costs. Journal of Occupational and Environmental Medicine, 52(1), 91–98.</p> <p>U.S. Department of Health and Human Services. (2022). What are sleep deprivation and deficiency?. National Heart Lung and Blood Institute.</p>
 <p>4 QUALITY EDUCATION</p>	Education Value	\$/student/year	Value of education/sustainability learning as a result of engaging students in nature-based activities or learning centers	Loomis, J. (2005) "Updated Outdoor Recreation Use Values on National Forests and Other Public Lands", United States Department of Agriculture, Forest Service, Pacific Northwest Research Station, General Technical Report.
 <p>7 AFFORDABLE AND CLEAN ENERGY</p>	Economic Impact of Light Pollution	per person	Savings of residential sustainable lighting practices	International Dark-Sky Association (2021) "Light Pollution Costs Money and Wastes Resources".
 <p>8 DECENT WORK AND ECONOMIC GROWTH</p>	Value of Ecotourism	\$/person/year	Consumer-surplus value for sightseeing activities such as stargazing	<p>Loomis, J. (2005) "Updated Outdoor Recreation Use Values on National Forests and Other Public Lands", United States Department of Agriculture, Forest Service, Pacific Northwest Research Station, General Technical Report.</p> <p>Collison, F. and Poe, K. (2013) "Astronomical Tourism": The Astronomy and Dark Sky Program at Bryce Canyon National Park, Tourism Management Perspectives, Volume 7, Pages 1-15.</p>
 <p>11 SUSTAINABLE CITIES AND COMMUNITIES</p>	<p>NOTE: Calculating the value associated with adopting outdoor lighting ordinances is challenging because each municipality can choose how long regulated entities have to comply. Other unknown variables include the number and type of already compliant lighting at the time of ordinance adoption, new installations following ordinance approval, and fixtures exempt or temporarily permitted per each municipality's ordinances.</p> <p>The specific lighting profile of any town before and after ordinance adoption would affect the dollar value of that ordinance and is highly variable.</p>			
 <p>13 CLIMATE ACTION</p>	Climate Impact of Light Pollution	\$/MT carbon	Social cost of carbon avoided by residential outdoor light reduction	<p>International Dark-Sky Association (2021) "Light Pollution Costs Money and Wastes Resources".</p> <p>Interagency Working Group on Social Cost of Greenhouse Gases, United States Government. (2021). Technical Support Document: Social Cost of Carbon, Methane, and Nitrous Oxide Interim Estimates under Executive Order 13990.</p>
	Air Quality Impact of Light Pollution	\$/MT N2O	Social cost of nitrous oxide avoided by reduction of outdoor light	<p>DeLonge, M. et al. (2014) "Greenhouse Gas Mitigation Opportunities in California Agriculture: Review of California Rangeland Emissions and Mitigation Potential". NI GGMOCA R 4. Durham, NC: Duke University.</p> <p>Interagency Working Group on Social Cost of Greenhouse Gases, United States Government. (2021). Technical Support Document: Social Cost of Carbon, Methane, and Nitrous Oxide Interim Estimates under Executive Order 13990.</p> <p>Stark, H (2010) City Lights Affect Air Pollution, University of Colorado.</p>

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