



**SEALOE**Earth  
Serene Environment And Life On Earth

A world in which all people participate in the stewardship of planet Earth.

SEALOE Earth in Special Consultative Status with the United Nations ECOSOC since 2017

## NEWSLETTER

### Earth Day 2025

*“The sun does not forget a village just because it is small.”*

*~ African Proverb*

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United Nations General Assembly. Photo credit: Dr. Chaitanya Hiremath

We hope that you will enjoy reading this newsletter



## Honored to Attend: First High-Level Meeting on Harmony with Nature and Living Well



**Dr. Chaitanya Hiremath**  
**United Nations General Assembly**  
**New York, USA**

On April 22, 2025—International Mother Earth Day—I had the honor of attending the *First High-Level Meeting of the General Assembly on Harmony with Nature and Living Well*, held at the UN Headquarters in the Trusteeship Council Chamber. Convened under General Assembly Resolution A/RES/79/210, this landmark event brought together voices from across the globe—UN agencies, Indigenous Peoples, civil society, academia, and independent experts—to explore holistic, multilateral approaches to sustainable development rooted in diverse worldviews.

The gathering emphasized the urgent need for transformative thinking and collaborative action to implement the 2030 Agenda through respect for Nature, Indigenous knowledge, and the principle of living well in harmony with our planet.



## Celebration of Earth

### Westford, Massachusetts, USA

On April 22<sup>nd</sup>, 2025, the Earth Flag was hoisted at the home of Dr. Chaitanya Hiremath.

## Environmental Distinction 2025

Inspiring environmental projects related to fostering biodiversity, strengthening ecosystems, and establishing sustainable practices were recognized.

### Environmental Award

#### Leading Through Environmental Education

Sonia Jackson, 16 (VA, USA)

## Global Essay Contest 2025



### Around the World

In the early 2025 alone, SEALOEarth's global reach included countries such as, Afghanistan, Australia, Austria, Bangladesh, Barbados, Bhutan, Cameroon, Canada, China, France, Germany, Ghana, Hong Kong, India, Indonesia, Ireland, Italy, Japan, Kenya, Liberia, Malawi, Malaysia, Mexico, Nepal, Netherlands, Nigeria, Pakistan, Philippines,

Poland, Republic of Korea, Romania, Russia, Rwanda, Singapore, Ukraine, United Kingdom, United States, Uzbekistan, and Zambia among others.

We were disappointed to receive fewer essays from across the globe. These essays underwent a meticulous blind-scoring process. The participation of students was encouraged by dedicated teachers from multiple schools.

### Essay Contest Awards

*"Examine select targets and measurement strategies for implementing proposed Earth-centered serene development goals across the domains of air, land, water, light, sound, thermal, nuclear, and space, with the aim of achieving a brighter future for all inhabitants of our planet."*

#### Youth (ages 9-13)

Yanze Li, 13 (Canada)

First Place

#### Junior (ages 14-18)

Emmanuel Reimmer, 17 (Canada)

First Place

#### Honorable Mention

Tshenden Tashi, 17 (Bhutan)

Christian Austero, 21 (Philippines)

Diana Webb, 57 (USA)

## Essay prompt for 2026

*"The planet's blind spots—and why they matter."*

The deadline is March 1, 2026.

For more information, please visit:

<http://sealoeearth.org/essaycontest.html>





Earth Day 2025. Photo credit: Dr. Chaitanya Hiremath



## Leading Through Environmental Education



**Sonia Jackson (16)**  
**Virginia, USA**

I made the decision to have a positive impact on our planet when I was in middle school. Climate change, in particular, is my biggest concern because it affects every living thing and people, especially those with fewer resources to cope, as well as oceans, animals, plants, insects, and much more. I realized that reducing our carbon footprint would be one of the most significant ways I could contribute to protecting the Earth.



Bon Air Park. Photo credit: Ellen M. Bozman Government Center

My journey began when I started working with my older brother and adopted Bon Air Nature Park in Arlington,

Virginia. I spent hours removing invasive English Ivy from mature Oak trees to help preserve them, as trees are essential for carbon capture. Additionally, I participated in a tree planting project where we planted over 400 native trees in protected areas throughout Fairfax, Virginia. It was rewarding to see the beautiful landscapes we had helped restore, knowing that these efforts would support thriving ecosystems. I also joined my school's Environmental Club as Vice President and help to lead invasive species removals and other environmental activities and education sessions. Finally, I am a certified stream monitor where I collect and analyze environmental indicators, such as macroinvertebrate data, to monitor stream health and pollution, which helps to monitor the effects of climate change.



Monitoring stream pollution. Photo credit: Sonia Jackson

More recently, I have also joined two organizations to help have a broader impact on the environment around me. I became a Student Board member with EcoAction Arlington, a local environmental group. I also joined the student leadership team of Arlington Students for Climate Action to help combat

climate change in the Arlington school district and at our County level. We have organized several initiatives including speaking at County Board meetings to ensure the younger generation is represented and that climate change initiatives are passed by the Board. Another initiative that we did was organize a sustainability clothing drive to reuse clothing instead of discarding and buying new. This resulted in over 1200 clothing items being reused. We are now working on a composting project to bring composting to our local school district, which is very exciting since this can have a huge impact on climate change and carbon emissions.



Sustainability clothing drive. Photo credit: Sonia Jackson

Although we still have a long way to go, my students' groups and I are committed to ensuring that we reduce climate change impact around us. If I am fortunate enough to win this award, it would help me share this idea with other schools, hopefully inspiring them to take similar steps so that we can amplify our impact in the fight against climate change.

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## Towards an Earth-Centered Future



**Yanze Li (13)**  
**Quebec, CANADA**

As humanity grapples with unprecedented environmental challenges, the call for Sustainable Development Goals resonates louder than ever. It has been a miracle that all 193 UN members have agreed on this point and are striving to contribute and work hard towards a better tomorrow. However, the progress for achieving the goals set for 2030 is taking longer than anticipated, and as the Secretary-General of the UN said himself, the rescue goals need rescuing. Only 15% of the objectives are on track and many of them have regressed. The situation is dire, yet hope remains. Despite ambitious global goals, local implementation remains challenging, especially in developing nations with limited resources and severe climate impacts. Economic inequality, political instability, and conflicts further hinder progress. While global consensus on the SDFs is a monumental achievement, the journey to their fulfillment will be long and full of obstacles. By redoubling efforts, fostering collaboration, and committing to these long-lasting solutions, we can still achieve the SDGs and create a brighter future.

### Air

Since the industrial revolution, atmospheric CO<sub>2</sub> concentration has continuously risen, causing what we call global warming today. According to Our World In Data, the average carbon dioxide concentration in our atmosphere in

2024 was approximately 422 ppm, equivalent to 3300 gigatons of CO<sub>2</sub>. In contrast, pre-industrial levels were barely 250 ppm. This sudden increase highlights the urgent need for action. The UN aims for a 45% reduction in CO<sub>2</sub> emissions from 2010 levels, but current trends suggest this goal is ambitious. A 15% reduction within the next decade, may be a more feasible target. However, with global gas concentration rising steadily in the past years, reversing the trend will be a significant challenge. According to the United States Environmental Protection Agency (EPA), gas emissions are predominantly associated with the transportation sector, accounting for over 28% of emissions. In fact, 94% of transportation fuel is petroleum-based, an extremely pollutive substance. To tackle this problem, regulations on vehicular emissions, investment in transport systems, and advancements in carbon capture technology are necessary. A key target would be reducing transportation-related emissions by 20% in the next decade. A measurement strategy would involve monitoring real-time emissions data from major urban areas, conducting annual reviews on industrial compliance, and tracking atmospheric CO<sub>2</sub> levels through satellite imaging.

### Land

Land sustains biodiversity, agriculture, and life. However, deforestation, soil degradation, and habitat destruction are slowly destroying the health of ecosystems. To counter this, achieving net-zero deforestation by 2050 is crucial, alongside restoring 25% of degraded forests by 2030. Additionally, protecting biodiversity by designating 20% of global land as a protected area by 2030 will ensure the protection of endangered species, especially in the Amazonian rainforest. Measuring progress will require monthly satellite imaging, GIS mapping and artificial intelligence analysis to track deforestation, soil quality and habitat loss. Biodiversity monitoring by camera traps and genetic sampling will further assess conservation and reforestation efforts. These strategies will help restore ecosystems and balance development with nature. Sustainable land management is essential to strive for a healthier planet.

## Water

Clean and accessible water is a basic human right, yet billions of people still face water scarcity and pollution. To address this necessity, it is crucial to ensure universal access to clean water by 2035 and to safeguard our lakes, rivers, and oceans from overexploitation and pollution. Key targets for water sustainability include improving safe accessibility, particularly in sub-Saharan countries who have suffered decades with the lack of clean drinking water. Achieving universal clean water access by 2045 remains the ultimate goal. The world has hitherto fought bravely and the percentage of deaths associated with hazardous drinking water has steadily decreased from 4% in 1991, to 1.2% in 2021. To ensure the success of our goal, combating cholera is an obligation. For instance, cholera testing kits and solar powered water pumps are great ways to protect drinkers from harm. Conducting annual progress reports and water safety missions will secure accessibility to water for all.



Water withdrawal by industries. Photo credit: Shutterstock / Kelyalyaynen

## Light

Just a hundred years ago, Americans would have been able to see a shiny, star sprinkled sky in the center of Manhattan. However, urban expansion has erased that view due to artificial light pollution. Excessive lighting can interfere with the natural rhythms of wildlife, affecting reproduction and feeding behaviors, while humans suffer from sleep disorders and increased energy consumption. Ensuring that 80% of metropolises and all protected areas adopt dark-sky policies by 2040 is the perfect first step in humanity's journey to reclaim the right to admire the serene night sky. NASA's VIIRS (Visible

Infrared Imaging Radiometer Suite) will come in extremely handy when it comes to measuring the progress of this colossal challenge.



Las Vegas Strip. Photo credit: Andrew Zarivny/Shutterstock.com

## Sound

In 2011, the WHO set recommendations for daytime and nighttime environmental noise levels, and found the maximum safe noise level for daytime is 55db (normal conversation) and at night, 40db (about the level of a quiet library). Beyond these levels, continuous exposure to environmental noise has been shown to cause health problems, and not just hearing-related ones. Despite this, 19 million Americans around the country experience 80db of noise on a daily basis, heavily affecting their sleep. Keeping city noise within WHO limits is challenging but achievable through regulation. An overwhelming majority of noise in bigger cities are caused by transportation, notably cars. Imposing stricter limits on roads after 7 pm is vital to allow a calmer evening and better sleep. To monitor all these efforts, IoT based decibel meters will be placed in different parts of big cities.



Strong Towns. Photo credit: Unsplash/chairulfajar\_.



## Thermal

The North Pole is disappearing due to global warming, threatening the habitats of polar bears, seals, and the Inuit nation. The increasing concentration of greenhouse gases is putting unbearable pressure on our planet. To mitigate this crisis, humanity must focus on emphasizing the importance of limiting global temperature rise to no more than 1.5 degrees Celsius above pre-industrial levels. Achieving this goal requires a reduction in fossil fuel use, as burning these fuels releases colossal amounts of carbon dioxide, the primary driver of global warming. Additionally, implementing environmentally friendly urban solutions, such as expanding green roofs and promoting urban agroforestry, can help reduce heat absorption and lower city temperatures. Tracking progress requires the use of thermal satellite data, MODIS and Landsat for instance, to continuously monitor urban temperature changes.



MODIS – NASA Ocean Color. Photo credit: NASA

## Nuclear

Nuclear energy faces ethical and safety concerns, but it remains a vital low-carbon energy source. The Earth-Centered Serene Development Goals (ECSDGs) aim to increase nuclear's share in global electricity to 25% by 2050, reduce nuclear waste by 50%, and deploy 300 next-gen reactors by 2040. Measurement strategies include AI-powered reactor monitoring for early fault detection, 100,000+ radiation detectors near plants, blockchain waste tracking, and fusion

progress monitoring through energy efficiency and plasma stability. These methods ensure nuclear energy's safe integration into our daily lives, balancing its benefits with strict safety regulations.

## Space

In 1961, Soviet astronaut Yuri Gagarin became the first human to travel into space, marking humanity's first step in space exploration. Since then, numerous astronauts have ascended to space and even on the moon. As human activity in space increases, so does the risk of orbital debris. Removing 90% of dangerous space debris larger than 10 cm by 2040, whilst limiting annual satellite launches to 1000 to limit overcrowding is a crucial step to balance space safety with the continued progress of space exploration. Orbital debris poses a significant risk to both manned and unmanned spacecraft, with collisions potentially causing unimaginable damage. To address this, innovative solutions such as active debris removal (ADR) technologies, including robotic systems and lasers to deorbit defunct satellites, must be developed.



Active Debris Removal (ADR) space robot to the capture of small space-debris. Photo credit: USCASS 2017

In conclusion, the right to have a safe, clean, and harmonious environment is universal to all of the inhabitants, human or animal, plant or bacteria of planet Earth. As Ryunosuke Satoro once said Individually, we are one drop. Together, we are an ocean. Together, we can build an Earth-centered future.

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## Examining Targeted Measurement Strategies for Earth-Centered Serene Development Goals Across Various Domains



**Emmanuel Reimmer (17)**  
**Ontario, CANADA**

The world is going through an age of environmental degradation, social injustice, and fast-paced technological evolution. It is against this backdrop that the Earth-Centered Serene Development Goals (ECS-DGs) have become a leading methodology for attuning harmonious interaction among people, nature, and technology. These goals bring in holistic development, considering the inter-dependency between different domains: air, land, water, light, sound, thermal, nuclear, and space. The essay discusses certain targets and measurement strategies that will be put into action for the implementation of the proposed ECS-DGs, with a dream of a better future for all beings on earth.

ECS-DGs represent a paradigm shift from conventional development goals, which too often come with a flagrant sacrifice of ecological and social well-being in the name of economic growth. The ECS-DGs focus on core aspects of sustainability, equity, and co-living of different life forms. Good measurement strategies enabling tracking and informed decision-making are critical for progress toward these goals.

Setting targets across domains is a good first step in meeting them. For example, in the area of air quality and pollution control, one of the core targets in the air domain is to reduce PM<sub>2.5</sub> concentrations to safe levels as defined by the WHO. Measurement strategies involve deploying low-cost air quality sensors in urban areas, complemented by satellite remote sensing data. Such a dual approach supports real-time monitoring and engages the community in identifying pollution hotspots.

Another domain is a land target that could aim at the restoration of degraded ecosystems to restore biodiversity by 30% by 2030. Monitoring would include mapping land-use change using GIS strategies, while the use of biodiversity indices assesses ecosystem health (Millennium Ecosystem Assessment, 2005). In the same vein, local communities could be involved in monitoring biodiversity through citizen science projects and hence create ownership.

Equally important is access to clean water. The measurement strategies involve satellite images to monitor water bodies and sensor networks in real-time assessment of the quality of water, testing parameters such as pH, turbidity, and contaminants. Such efforts, when combined with social surveys, might offer insight into community needs and experiences about water access and quality.

Another area is light pollution mitigation. The objective might be to lessen artificial light pollution in urban areas by 50% by the year 2035. The innovative measurement strategy might involve satellite data to map the light emissions and community workshops raising awareness about the influence of light pollution on wildlife and human health. In addition to the above-mentioned examples, targets regarding the establishment of dark-sky preserves can also represent measures for success.

An objective in the soundscapes and noise reduction domain could be to reduce urban noise levels in sensitive areas by 30% by 2030. Measurement strategies may involve acoustic sensors deployed in the urban environment to map noise pollution patterns, complemented by community health impact

surveys. Integrating soundscape studies would enable practitioners to create quieter urban environments that are more conducive to well-being.

In the context of climate change, a goal in the thermal arena might involve increasing urban green cover by 25% by 2035 to reduce heat island impacts. Approaches for measurement may include remote-sensing data on vegetation change assessments and urban heat mapping to underpin urban planning decisions. The involvement of citizens in planting and maintaining urban greenery can also be part of reaching and measuring such a target.

Also, while pursuing nuclear energy as a feasible alternative, it is imperative to set goals for the reduction of nuclear waste by 40% no later than 2040. Measurement strategies should cover the environmental radiation monitoring system and holistic data on waste management practices. It will be important to collaborate on international safety standards to ensure that transparency and community trust are maintained in nuclear developments.

Finally, a forward-looking goal for the space area could be to create standards for space use sustainability. This would include minimizing space junk and encouraging responsible satellite launches. Measurement strategies could include using space tracking technologies and international collaboration in developing reporting mechanisms for space traffic management.

To drive the implementation of ECS-DGs forward, it is imperative to invest in systems that foster robust measurement frameworks. One groundbreaking finding is that integrating technology such as Artificial Intelligence (AI) and machine learning into these measurement systems can enhance data collection and analysis, enabling real-time monitoring of various environmental parameters (United Nations Environment Programme, 2021).

Investment in capacity building is also key in ensuring that the local communities are equipped with the means and knowledge to effectively participate in the monitoring. These

data should be shared among stakeholders government, NGOs, local communities, and researchers through collaborative platforms in ways that foster inclusiveness in measuring the progress.

The success of the realization of ECS-DGs hugely depends on laying targeted measurement strategies in the air, land, water, light, sound, thermal, nuclear, and space. It is through integrating innovative technologies, community involvement, and clearly defined goals that drive us to our shared goal of making our planet viable for all its inhabitants. The road ahead will be difficult but must be traveled; together, we can create a symbiotic relationship between humans and the Earth where humans can coexist in harmony for generations to come, provided there is collective effort and investment in measurement systems. Further, education and awareness of such goals will capacitate individuals and communities to act at the level of their daily lives.

Through key partnerships among sectors-government, private, and non-profit-sharing resources and expertise can be achieved for the effective implementation of sustainable practices. It is in this way that our efforts toward Earth's well-being, by understanding holistically, nurture a deeper sense of each of these domains and their interrelationships, which forge a path for the coexistence of humans with nature. We can together build resilient communities that consider the care of the environment, so that future generations may inherit a healthy planet.

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## Earth Centered Serene Development: A Holistic Approach to Sustainable Progress Across Environmental Frontiers



**Tshenden Tashi (17)**  
**Timphu, BHUTAN**

Humanity stands at a defining moment in history, where economic and technological progress must be harmonized with environmental preservation to ensure a thriving planet for future generations. The Earth-Centered Serene Development Goals (ECSDGs) propose a holistic framework that integrates human development with the natural world, fostering balance and sustainability across all critical environmental domains. Unlike traditional sustainability efforts that merely aim to reduce harm, ECSDGs emphasize a serene coexistence between human activities and the Earth's fundamental systems. This approach recognizes that a sustainable future requires not only mitigating environmental damage but also actively restoring and protecting the planet's ecosystems. ECSDGs focus on eight key environmental domains of air, land, water, light, sound, thermal, nuclear and space each of which plays a vital role in maintaining planetary equilibrium. This essay examines the select targets and measurement strategies necessary to implement ECSDGs effectively, ensuring a healthier and more sustainable, also prosperous future for all inhabitants of Earth.

Additionally, one of the most urgent environmental concerns is air quality, which directly impacts human health, climate stability, and ecological balance. Industrialization,

deforestation, and excessive carbon emissions have led to increasing air pollution, contributing to respiratory diseases and global warming. ECSDGs aim to reduce global air pollution levels by 50% by 2050 through the transition to zero-emission energy sources, sustainable urban planning and reforestation initiatives. Measurement strategies for achieving these targets include monitoring air quality index levels, tracking carbon dioxide and methane emissions and assessing global forest coverage and carbon sequestration rates. Implementing strict emission regulations for industries, promoting electric and hydrogen powered transportation and expanding afforestation programs will significantly improve air quality. Additionally, investments in carbon capture technologies and sustainable agriculture will play a crucial role in ensuring a cleaner, healthier atmosphere for future generations.

Moreover, an essential component of ECSDGs is land conservation and sustainable land use. Human expansion, deforestation and unsustainable agricultural practices have led to biodiversity loss, desertification and ecosystem disruption. To counter these issues ECSDGs have set targets to halt deforestation and restore 30% of degraded land by 2040, for promoting sustainable agriculture, responsible urban planning, and wildlife conservation. The success of these efforts can be measured through satellite imagery to track deforestation and land degradation rates, biodiversity indexes and soil quality assessments. Policies that encourage reforestation, permaculture and regenerative farming techniques will ensure a balanced interaction between human development and the natural environment. Furthermore, strengthening protected areas and wildlife corridors will help safeguard endangered species and maintain biodiversity. As land plays a crucial role in climate regulation and food security, sustainable land use practices are essential for long term environmental stability.

Furthermore, water sustainability is another pillar of ECSDGs, as water is fundamental to life and economic development. Pollution, over-extraction and climate change have resulted in severe water crises worldwide, affecting millions of people and countless ecosystems. ECSDGs propose targets to achieve 100% access to clean drinking water by 2035,

reduce plastic waste in oceans and freshwater bodies by 80% and improve water conservation and recycling technologies. These objectives can be measured by tracking water pollution levels, freshwater availability, groundwater depletion rates and plastic waste accumulation in marine environments. Implementing wastewater treatment facilities, eco-friendly farming methods and strict regulations on plastic production and disposal will play a pivotal role in achieving these goals. Encouraging industries and households to adopt water-efficient technologies, rainwater harvesting systems and desalination plants powered by renewable energy will ensure long-term water security. Addressing water sustainability is crucial, as it not only impacts human health and food production but also influences climate patterns and global biodiversity.



Global Biodiversity. Photo credit: *Copernicus*

Therefore, beyond the traditional environmental elements, ECSDGs also focus on light, sound, thermal, nuclear and space domains, which are often overlooked in sustainability discussions. Light pollution disrupts ecosystems, affects human circadian rhythms and wastes energy. ECSDGs aim to reduce excessive artificial lighting by promoting energy-efficient designs and dark-sky policies. Similarly, noise pollution from industrial and urban activities harms wildlife and human well-being; setting regulations to limit urban noise levels and design quieter transport systems can significantly reduce its negative impact. In the thermal domain, addressing the urban heat island effect through green roofing, reflective surfaces and increased

urban vegetation will help regulate temperatures in densely populated areas. Nuclear safety is another critical component, requiring strict measures to prevent nuclear accidents, manage radioactive waste and ensure ethical advancements in nuclear energy. Lastly, the space domain faces increasing challenges due to satellite congestion and space debris. ECSDGs advocate for sustainable space exploration policies, satellite deorbiting technologies, and responsible asteroid mining regulations to prevent environmental degradation beyond Earth's atmosphere. Each of these domains plays a vital role in ensuring a serene and sustainable future where technological progress does not come at the cost of environmental destruction.

In a nutshell, the Earth-Centered Serene Development Goals present a visionary approach to achieving harmony between human progress and the planet's natural systems. By focusing on air, land, water, light, sound, thermal, nuclear and space domains, ECSDGs ensure that development is both sustainable and conducive to long-term planetary health. Through clear targets, measurable strategies, and proactive policies, humanity can transition towards a future that prioritizes environmental restoration, technological responsibility and social well-being. The successful implementation of ECSDGs will not only mitigate the ongoing climate crisis but also pave the way for a more resilient, equitable and flourishing world for all species. If global leaders, industries and communities embrace this framework, the dream of a sustainable, peaceful, and thriving planet can become a reality.

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## For a Brighter Future for All Inhabitants of Our Planet



**Christian Austero (21)**

**Misamis Occidental, PHILIPPINES**

The United Nations' Sustainable Development Goals (SDGs), adopted in 2015, were primarily human-centered, aiming to address critical issues like poverty, education, and climate change. However, as we approach 2030, the call for a more holistic and Earth-centered approach is gaining momentum. The proposed Earth-Centered Serene Development Goals (SDGs) advocate for the inclusion of non-human entities in sustainable development efforts. This shift necessitates reorganizing targets under essential domains such as air, land, water, light, sound, thermal, nuclear, and space. By focusing on these elements, we can foster a balance that ensures the well-being of all planetary inhabitants. This essay explores select targets and measurement strategies for implementing these serene development goals, aiming to create a sustainable and harmonious future.

One of the foremost targets in the Air Domain is reducing airborne pollutants to ensure a healthier atmosphere. Poor air quality leads to respiratory diseases, disrupts ecosystems, and exacerbates climate change. Measurement strategies for this target include tracking atmospheric particulate matter (PM<sub>2.5</sub> and PM<sub>10</sub>) through satellite monitoring and ground-based sensors. Additionally, global greenhouse gas emissions should be monitored using carbon footprint assessments. Promoting afforestation, renewable energy adoption, and stricter air pollution regulations can help

mitigate harmful emissions. Countries like Sweden have successfully reduced carbon emissions through aggressive policies and technological innovations, setting an example for global implementation (UNEP).

The Land Domain emphasizes restoring degraded ecosystems and preventing deforestation. According to the United Nations Convention to Combat Desertification, over two billion hectares of land worldwide require rehabilitation. To measure progress, land-use change data should be analyzed using Geographic Information Systems (GIS) and satellite imagery. Additionally, biodiversity indices, such as species richness and population health, can serve as indicators of ecosystem vitality. Community-driven conservation initiatives, as seen in Costa Rica's reforestation programs, can provide scalable models for land preservation (FAO).



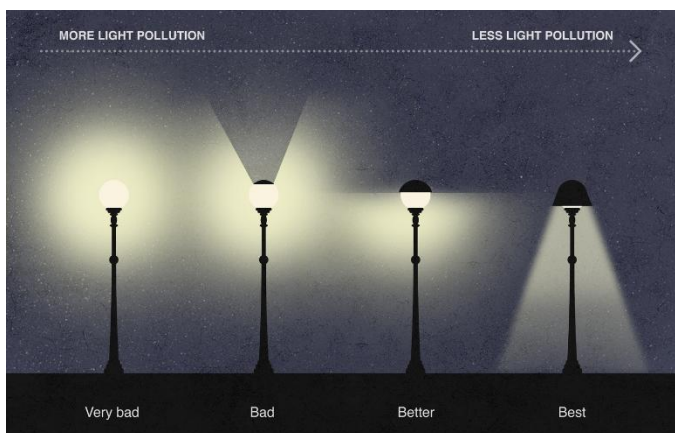
Before, during and today. Photo credit: *Daniel Janzen and Winnie Hallwachs*

Ensuring clean water access while safeguarding aquatic ecosystems is paramount in the Water Domain. Current SDGs address clean water and sanitation (SDG 6) and life below water (SDG 14), but Earth-Centered SDGs should integrate these into a single, holistic framework. Key targets include reducing water pollution, enhancing freshwater availability, and preserving marine biodiversity. Measurement strategies involve monitoring chemical contamination levels in freshwater sources, assessing groundwater depletion rates, and tracking ocean acidification trends. Singapore's New Water initiative, which recycles wastewater into potable water, exemplifies sustainable water management (UNESCO).



Singapore's Water Loop. Photo credit: *Singapore's National Water Agency*

Light pollution disrupts natural circadian rhythms, affects nocturnal wildlife, and reduces visibility of celestial bodies. A serene development goal for the Light Domain would focus on reducing unnecessary artificial lighting. Measurement strategies include mapping sky brightness levels using satellite observations and citizen science initiatives such as the Globe at Night project. Enforcing regulations on excessive outdoor lighting and encouraging the use of energy-efficient LED fixtures can significantly mitigate light pollution. Cities like Tucson, Arizona, have successfully implemented dark-sky ordinances, serving as a model for other urban areas (International Dark-Sky Association).



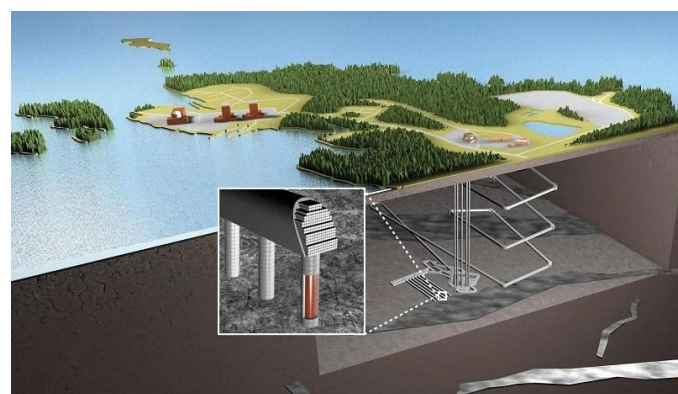
Reducing light pollution. Photo credit: *Valeria Montjoy*

Excessive noise pollution from industrialization, transportation, and urbanization has detrimental effects on human health and wildlife. The Sound Domain within Earth-Centered SDGs should target noise reduction in critical habitats

and urban environments. Measuring noise pollution requires deploying decibel monitoring stations in high-risk areas and assessing its impact on biodiversity. Strategies such as urban green buffers, stricter noise ordinances, and the promotion of quieter transportation alternatives can contribute to noise reduction. Switzerland's railway noise abatement program demonstrates a successful application of such initiatives (World Health Organization).

The Thermal Domain focuses on mitigating extreme temperature fluctuations exacerbated by climate change. Heat islands in urban areas pose significant health risks, especially in densely populated regions. Measurement strategies include satellite thermal imaging, temperature anomaly assessments, and tracking global heating trends. Solutions such as green roofing, reflective building materials, and increased urban tree cover can help regulate temperatures. Japan's Cool Roof initiative, which promotes heat-resistant roofing materials, provides a blueprint for other countries to follow (IPCC).

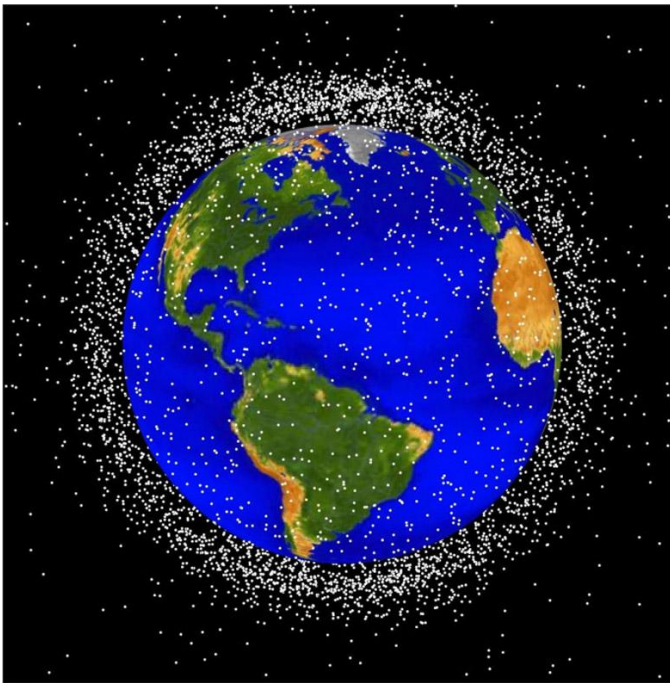
Nuclear energy presents both opportunities and risks for sustainable development. The Nuclear Domain within the proposed SDGs should ensure the safe and responsible use of nuclear technology while managing radioactive waste effectively. Progress measurement includes monitoring nuclear reactor safety compliance, assessing radiation exposure levels, and tracking the disposal of nuclear waste. Countries like Finland, which has pioneered deep geological repositories for nuclear waste storage, offer effective models for nuclear sustainability (IAEA).



Artist rendering of the Onkalo facility's underground layout for storing radioactive waste. Photo credit: *Posiva*



As space exploration advances, ensuring the sustainability of outer space activities becomes crucial. The Space Domain should prioritize reducing space debris, promoting ethical resource utilization on extraterrestrial bodies, and maintaining the integrity of celestial environments. Measurement strategies include tracking orbital debris density using ground-based telescopes and satellite sensors, evaluating planetary contamination risks, and developing sustainable space policies. The European Space Agency's space debris removal initiatives serve as an important precedent for future space governance (ESA).



A snapshot of low Earth orbit debris. Photo credit: *Claude Phipps/SPIE*

The shift toward Earth-Centered Serene Development Goals reflects an urgent need to integrate environmental harmony into sustainable development. By realigning targets across the domains of air, land, water, light, sound, thermal, nuclear, and space, we can create a framework that fosters coexistence between human and non-human entities. Implementing effective measurement strategies—ranging from satellite monitoring to community-driven conservation efforts—ensures that these goals remain actionable and trackable. As we approach 2030 and beyond, the global community must embrace a holistic, earth-centered vision for a sustainable and equitable future.

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## New Indicator for SDG 11.c: Accelerating Earth-Friendly Rural Home Construction Through Private Collaborative Innovation



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The United Nations Sustainable Development Goals 11 says, “Make cities and human settlements inclusive, safe, resilient and sustainable.” Ten targets mainly focus on urbanization due to projected migration from rural areas to cities. (“Goals 11–Make cities and human settlements inclusive, safe, resilient and sustainable”) The focus on cities makes sense since projections indicate approximately 70% of the global population will live in urban areas by 2050. However, addressing climate change and serene development should not minimize meeting the needs of rural, impoverished areas. Target 11.c says to “Support least developed countries, including through financial and technical assistance, in building sustainable and resilient buildings utilizing local materials.” (“Targets And Indicators”). There are no indicators for this target.

The proposal is to add a Target 11.c indicator to develop affordable, sustainable rural housing through collaboration among small to medium-sized local and global innovators while promoting rural community economic success. While governments are essential to meeting SDGs, other organizations can play central roles. The discussion

frames the challenges, followed by examples supporting the potential for integrating, scaling, and measuring collaborative innovation by private and nonprofit entities, which often function independently through their initiatives.

### The Challenge

It is imperative to prepare for the burgeoning need for quality, affordable housing to accommodate the growth of urban populations and eradicate slums. It should not be at the risk of failing to meet the housing needs of impoverished people in global rural areas who will remain rural. The World Bank indicates that 8.5% of the world’s people live in extreme poverty on less than \$2.15 per day. At \$6.85 per day, 44% remain in poverty, approximately 3.5 billion people. (World Bank) Data from 110 developing countries found that 1.1 billion out of 6.1 billion are poor, and 824-991 million lack adequate sanitation, housing, or fuel for cooking. Living standards are one-third of the global multidimensional poverty index structure. (Poverty, Prosperity, and Planet Report 2024: Pathways Out of the Polycrisis) People experiencing poverty in rural areas lack access to affordable housing and are unable to withstand climate change impacts. Yet, it is the impoverished who are living in areas where the impacts of climate change are most severe.



Climate change has increased the likelihood and intensity of flood – World Economic Forum. Photo credit: *REUTERS/Christophe Van Der Perre*

Secure shelter is a fundamental human right. The economically challenged struggle to find or build affordable housing that minimizes climate change risks of natural disasters like flooding and hurricanes. They also lack access to

affordable materials that do not destroy local natural resources because the cost of importing materials is prohibitive. Rural communities need safe, durable housing that protects the environment and supports other SDGs, especially poverty reduction, education, and health.

There are new, standalone approaches integrating unique materials and designs that foster a connection between people and their local environment, supporting serene development and SDGs. These efforts, while crucial for achieving multiple SDGs, are overshadowed by the focus on slum eradication, preventing them from receiving the broader attention needed to accelerate progress.

Meeting SDGs is not on track for many reasons, including but not limited to, the COVID pandemic, war, geopolitical tensions, and lack of governmental commitment and funding. When nations and their citizens feel overwhelmed with significant issues as aforementioned, it inevitably leads to inaction in meeting SDGs. The challenge of global warming seems so immense, intractable, and stressful that it is easy for individuals and organizations alike to acknowledge it, and then ignore it.

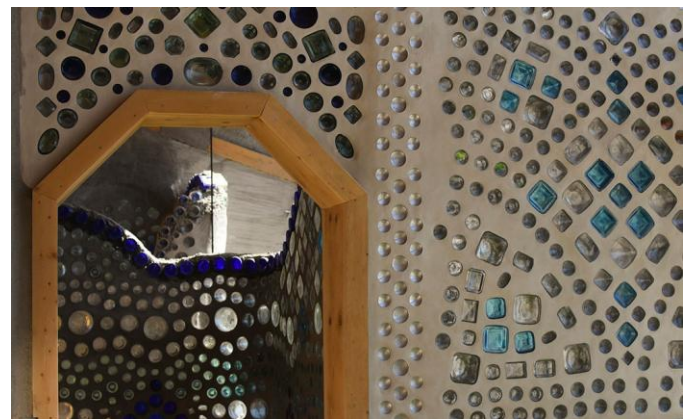
Recognizing and integrating housing innovations in global government strategy could lead to more progress toward meeting SDG 11 for rural communities. A new SDG Target 11.c indicator could read: Target XXX – Increase housing affordability in rural impoverished areas by utilizing collaborative, innovative designs that are harmonious with the local environment. More collaboration among individuals, smaller organizations (private, nonprofits, NGOs, research organizations, etc.) and larger green organizations could accelerate environmentally harmonious housing solutions for rural, impoverished people. Collaboration could trigger new perspectives and approaches by larger “green” organizations with access to more resources.

Scaling Local Innovations to Achieve Progress: The Potential of Grassroots Innovators in Solving the Rural Housing Crisis

Erle Rahaman-Nronha, born in Kenya, is the Director of Caribbean Permaculture Consultants, Ltd. and has a farm, once owned by colonialists, on Trinidad. He has reforested the land, now turning his attention to the buildings. Some are older buildings, remnants of colonial plantations, but newer structures are being built using traditional Trinidadian building methods. Structures are built with what is available rather than importing materials and in styles that increase structural resilience to the effects of global warming on Trinidad. (Baksh) The effects include rainfall changes, sea level rises causing increased flooding, increased hurricane frequency and intensity, and land and habitat erosion.

Rahaman-Nronha supports serene development, even if he does not call it that. Traditional building practices do not account for environmental elements like rainfall and wind patterns, and plant and animal life. They are disconnected from the environment, and the boxy Western architectural style has little relevance for the island, which experiences intense heat during the dry season, and hurricanes and flooding during the wet season. (Baksh)

Rahaman-Nronha is applying traditional practices that embrace earth building, using locally available materials, specifically for use in developing grass- and clay-based structures that keep buildings cooler. Other practices include raising the building off the ground to circulate air and protect it from flooding and incorporating waste in construction, such as discarded tires, plastic waste, and colored glass bottles. (Baksh)



Building with natural and repurposed materials. Photo credit: *Earthship Biotecture*



The Nepal Eastern Terai region is one of the least developed countries, and affordable housing is a serious issue. The Hilti Foundation developed a new bamboo frame technology, and working with Habitat for Humanity Nepal, are developing affordable housing for low-income families. The specially treated bamboo and cement plaster make the homes more resistant to earthquakes and have 70% less carbon emissions. Local and international partners, including NGOs, financial institutions, federal and local governments, bamboo treatment centers, and local communities and trades, are working together to scale cement bamboo frame technology. (Habitat for Humanity)

There is an immediate need to scale up such collaborative initiatives. Noteworthy, the approach has many other benefits besides reduced carbon emissions and disaster-resistant housing. Local farmers can grow high-quality bamboo, knowing it has a market, leading to job growth and an expanded construction workforce. This model is more likely to accelerate housing development for impoverished communities, and thus progress towards SDG Target 11.

DURABRIC is a brick made from compressed red soil, sand, and cement that does not need firing, thereby contributing to less deforestation and reduced air pollution. The new technology by 14Trees Sustainable Building saves fourteen trees per house, halting land degradation and biodiversity loss. These bricks reduce CO2 emissions by 80% compared to wood-fired burnt bricks and create higher-quality structures. The bricks are used in Malawi, Africa, with a poverty rate greater than 50%, to build more sustainable homes, hospitals, and schools. (Climate Impact Partners)



DURABRIC Homes builds homes in Malawi. Photo credit: Lafarge Eco System

## Leaving No One Behind

Increased cooperation, knowledge, and resource sharing among architects, engineers, construction organizations, local communities, and climatologists are needed to accelerate innovation and implementation. The United Nations states in a video promoting working together, “We need a new paradigm built on pillars of our 17 goals. Rethink convention. Flip the orthodoxy. Government, organizations, corporations, and citizens of the world snap out of it... We cannot afford to leave anyone behind.” (“Red Alert - How to Meet the Sustainable Development Goals Together” 0:02:56-02:04:37) Leaving the rural poor behind is not an option.

Providing safe, affordable housing in rural areas improves the quality of life in several measures. Children living in stable housing perform better at school. Family health is improved. Financial outcomes are improved. Affordable housing has a payment of less than 30% of income, freeing money for necessities like food and transportation. Jobs are created, enabling skills development. By uplifting the quality of life, people can work, participate in community education programs, and pursue entrepreneurial opportunities.

One of the contributing factors to the development of slums reflects people’s ill-preparedness to succeed due to factors which lack education and relevant job skills. As urban migration continues, better-prepared rural populations that do move to cities will reduce slum development. But it is vital to remember that tens of millions will remain rural. “Rurbanomics” refers to the linkages between rural and urban areas. As urbanization increases, there will be a growing need for the goods and services rural populations can provide, in particular, nutritious foods. (“A Global Rural Crisis: Rural Revitalization Is the Solution”) Rural communities will benefit through increased employment and growing local economies.



Urban-Rural Linkages. Photo credit: *UN-Habitat*

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As highlighted by the UN, "The UN Statistical Commission has identified more than 230 indicators, concrete measurements countries will use to track and report progress to stay on course. Reporting on these indicators will require countries to collect and manage enormous amounts of data disaggregated by gender, age, geography, income and others." ("Investing in Measuring Progress towards the SDGs" 0:00:32-00:00:53) Indicators should include measurements on the results of private collaborative efforts, and not just government efforts, addressing housing in poor, rural areas and the impact on environmental factors, including critical components like water and air quality, and community economics, such as jobs created and incomes increased.

Are global organizations and governments crucial to reaching SDGs? Yes! However, individuals and organizations implementing climate-resilient, affordable rural housing recognize their key role in meeting SDGs, no matter how small their role may seem compared to global goals. Doing a better job at collaboration across the board and taking a deeper dive into data collection could be a significant step in accelerating progress in SDG 11.

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