

Climate Catalysts Mentorship Programme 2.0



GREEN SKILLS FOR A GREEN FUTURE BOOTCAMP DIGEST



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youthinkgreen



MINISTERO DELL'AMBIENTE
E DELLA SICUREZZA ENERGETICA

Workshop 1 : Technical & Specialized Green Skills



Overview

Technical and specialized green skills are essential for a sustainable future — particularly across five key domains: renewable energy, circular economy, agriculture, water management, and green infrastructure. Developing expertise in these areas, along with a strong understanding of the technologies and practices that drive the global green transition, enables more effective and efficient climate action.

Latest trends and skill gaps in Renewable Energy

- Technologies and costs associated with generating electricity and thermal energy have advanced significantly over the past two decades. According to a [July 2025 IRENA report](#), renewables continue to prove themselves as the most cost-competitive source of new electricity generation — 91% of newly commissioned utility-scale renewable capacity delivered power at a lower cost than the cheapest new fossil fuel alternative.
- In 2024, renewables helped avoid USD 467 billion in fossil fuel costs, reinforcing their role in enhancing energy security, economic resilience, and long-term affordability.
- However, energy storage remains a major barrier to the large-scale adoption of renewable energy technologies, limiting their ability to provide a consistent and reliable power supply.

Solar Energy

In 2024, solar photovoltaics (PV) were, on average, 41% cheaper than the lowest-cost fossil fuel alternatives. The current cost of Solar Energy Power generation \$0.043 per kilowatt-hour (kWh) in 2024. Solar energy was the largest source of renewable capacity at 42.0% or 1,866 GW. (Source: [Renewable energy statistics 2025](#); IRENA)

Skills Gap:

The solar sector increasingly requires specialized expertise in system design, grid management, and digital optimization. Skills in AI-driven forecasting, IoT-enabled performance monitoring, and advanced materials engineering are in high demand to enhance system efficiency, predict generation patterns, and improve battery storage performance.

Innovation Inspiration:

Emerging innovations in this field feature higher efficiencies (around 24–25%) and include organic photovoltaic cells, flexible and transparent modules, and hybrid systems capable of capturing both heat and electricity.

Wind Energy

Onshore wind remains the lowest-cost renewable energy source, with an average power generation cost of USD 0.034 per kWh. The sector continues to evolve, with companies developing decentralized and community-friendly technologies designed for lower wind profiles. Moreover, the integration of solar and wind farms is showing strong potential and increasing deployment, enabling more stable and efficient renewable energy generation.

Skills Gap:

The market increasingly demands specialized skills in applying AI and deep technology to optimize wind energy generation and its integration with other power sources on the grid. There is also a growing need for expertise in designing next-generation wind turbines suited to lower wind profiles and diverse environmental conditions.

Innovation Inspiration:

The recycling and disposal of wind turbines, including towers, blades, and other components, remain significant challenges. Advancements in materials science and end-of-life technologies hold strong potential to enhance the sustainability and circularity of wind energy systems. (Source: [End-of-Life wind turbine blades: Review on recycling strategies](#), Spini and Bettini, 2024)

Bioenergy

Bioenergy remains a key pillar in diversifying the renewable energy mix, with an average global power generation cost of USD 0.067 per kWh. In developed regions, progress focuses on large-scale biorefineries and industrial biogas and biodiesel plants increasingly integrated into national energy systems. In developing economies, decentralized small-scale digesters are expanding rural energy access and promoting circular farming through compost and organic fertilizer production. This diversity highlights bioenergy's adaptability to different socioeconomic contexts and its growing role in sustainable energy transitions. (Source: IEA's [Bioenergy Annual Report 2024](#) & IRENA's [Renewable power generation costs in 2024](#))

Skills Gap:

The sector requires advanced technical and engineering skills to improve feedstock management, biogas purification, and biofuel conversion efficiency. There is also growing demand for policy, data analysis, and circular economy expertise to strengthen the integration of bioenergy into national energy strategies. Despite its potential, biodiesel adoption remains limited in many developing economies, underscoring the need for capacity-building, financing mechanisms, and technology transfer.

Innovation Inspiration:

Current research and technological innovation are focused on reducing lifecycle emissions, minimizing methane leakage, and developing next-generation bio-based materials. Advances in bioreactor design, microbial engineering, and carbon capture from bioenergy (BECCS) hold strong potential to make bioenergy systems cleaner, more efficient, and carbon-negative over time.

Hydropower

Hydropower remains one of the most established and cost-effective renewable energy sources, with an average global generation cost of USD 0.048 per kWh. Meanwhile, wave and tidal energy technologies are still in early development but show strong potential, particularly for coastal and island nations aiming to diversify their renewable energy mix and enhance grid stability. As innovation advances, these ocean-based solutions are expected to complement traditional hydropower and expand the scope of sustainable blue energy systems. (Source: [Ocean Energy Systems Annual Report 2024](#))

Skills Gap:

The sector requires specialized expertise in marine engineering, hydrodynamics, and environmental impact assessment to improve the design and efficiency of next-generation wave and tidal systems. There is also a growing need for data analytics, modeling, and materials innovation to enhance performance and durability in challenging marine environments.

Innovation Inspiration:

Current research is exploring durable marine materials, modular turbine designs, and AI-driven forecasting systems to enhance energy capture, durability, and maintenance efficiency in wave and tidal energy technologies.

Latest trends and skill gaps in Circular Economy

Circular economy practices are reshaping how industries manage resources by shifting from a linear “take make dispose” model toward closed-loop systems that emphasize reducing, reusing, and recycling. This transition is driving innovation in sustainable product design, materials recovery, and waste valorization, but also exposing a growing skills gap in implementing circular solutions at scale.

Skills Gap:

Advancing the circular economy requires interdisciplinary expertise spanning materials science, product design, waste management, and data analytics. Professionals with skills in lifecycle assessment (LCA), supply chain circularity, and policy implementation are increasingly in demand. Additionally, practical skills in community engagement and behavioral change communication are essential to strengthen local participation in waste segregation and recycling systems.

Innovation Inspiration:

The circular economy is being driven by new skill applications across several focus areas:

- **Alternatives to Single-Use Plastics:** Innovations in bioplastics, compostable packaging, and multi-use material systems require skills in polymer engineering, product design, and market development to scale eco-friendly replacements for conventional plastics.
- **Organic Waste Recycling:** Strengthening the use of organic waste through home composting, community gardening, and decentralized collection systems depends on urban sustainability planning, soil science, and waste-to-value entrepreneurship to improve recycling efficiency.

- **Reusing Glass:** Designing refillable, modular, and reusable glass containers to reduce energy-intensive recycling processes calls for innovation in sustainable packaging design, reverse logistics, and circular business modeling.

As these innovations mature, integrating digital tools such as AI, IoT, and blockchain to track material flows and verify recycling outcomes will further strengthen transparency, efficiency, and accountability across the circular economy value chain.

Latest trends and skill gaps in Agriculture

Agriculture is adopting innovative practices to boost productivity while conserving resources. Changing Climate, water scarcity, and increased soil salinity have increased the demand for approaches such as permaculture, soilless farming, and agrovoltaics are helping create resilient and climate-smart food systems.

Skills Gap:

The sector increasingly requires expertise in sustainable land management, climate-smart farming, and agri-tech applications. Skills in IoT-based monitoring, controlled-environment systems, and renewable energy integration are key to scaling modern, efficient agricultural models.

Innovation Inspiration:

- **Permaculture:** Adapting natural ecosystem design to agriculture calls for skills in regenerative planning, biodiversity management, and community-scale design.
- **Soilless Agriculture:** Expanding hydroponic, aquaponic, and aeroponic systems requires skills in nutrient management, system maintenance, and urban farming entrepreneurship.
- **Agrovoltaics:** Integrating solar energy and crop systems demands knowledge in renewable energy design, microclimate optimization, and agro-engineering.

Latest trends and skill gaps in Water Management

Technological innovation is redefining how water is sourced, purified, and reused through desalination, wastewater treatment, and atmospheric water generation. These solutions are vital for communities facing droughts and water stress.

Skills Gap:

There is growing demand for expertise in hydrology, environmental engineering, and water resource management, alongside skills in data analytics and sustainable infrastructure design.

Innovation Inspiration:

- **Water Desalination and Purification:** Expanding low-cost, decentralized systems requires skills in membrane technology, solar-powered filtration, and system maintenance.
- **Wastewater Treatment:** Developing greywater and blackwater separation and nutrient recovery systems calls for knowledge in biological treatment processes and wastewater reuse applications.
- **Water Generation:** Technologies that extract water from air humidity depend on skills in material innovation, energy efficiency, and device deployment for remote or arid areas.

Latest trends and skill gaps in Green Infrastructure

Green infrastructure connects systems that drive low-carbon development, combining advances in mobility, energy efficiency, and air quality to build more sustainable cities and industries

Skills Gap:

The field increasingly requires urban planning, renewable energy integration, and data-driven environmental management skills, as well as coordination across policy and technology sectors.

Innovation Inspiration:

- **Electric Mobility:** The expansion of EVs across transport modes creates demand for skills in battery technology, charging infrastructure, and supply chain management.
- **Energy Efficiency:** Meeting global climate goals requires professionals skilled in building retrofits, smart energy systems, and energy performance modeling.
- **Air Quality:** Innovations in nature-based solutions and digital air monitoring highlight the need for expertise in pollution tracking, environmental data analysis, and urban green design.

Workshop 2 : Growth & Leadership Green Skills



Overview

Green skills are more than technical expertise—they require leadership, communication, and problem-solving. As the climate crisis grows, it's clear that technology alone is not enough; real solutions depend on creativity, collaboration, and the ability to engage diverse stakeholders. With Africa's large youth population, these soft skills are especially vital for driving a just and effective green transition.

Climate action is about people. Global frameworks like the Paris Agreement set direction, but progress happens only when leaders can build trust, facilitate collaboration, and ensure all voices are heard. Success in the climate action landscape comes from balancing technical and soft skills:

- A waste-to-energy startup needs engineers (technical) and community mobilizers and policy advocates (soft).
- A youth delegate at COP must understand NDCs (technical) and also negotiate and persuade (soft).
- Climate journalists analyze data (technical) but shape impact through storytelling (soft).

These skills matter at every level. Globally, stakeholder engagement shapes NDCs, climate finance, and transparency by connecting governments, private sector, and civil society. Locally, effective leaders must:

- **Collaborate:** Build trust and partnerships.
- **Advocate:** Use stories to mobilize communities.
- **Negotiate:** Balance priorities and reach fair agreements.
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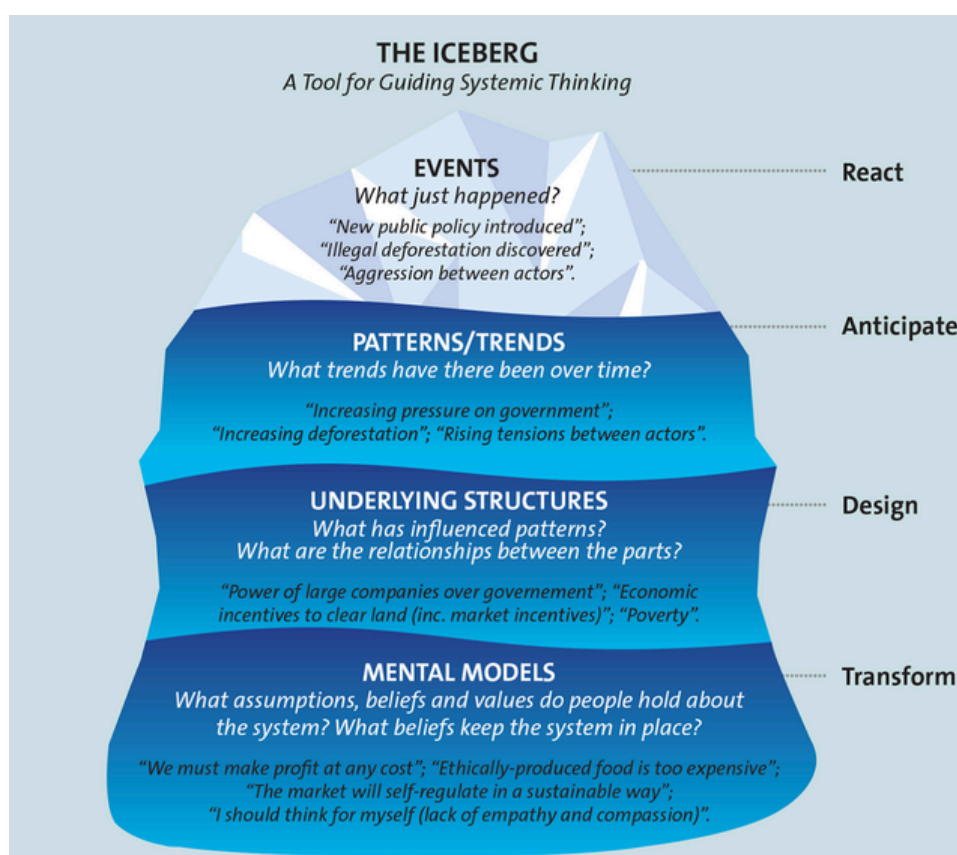
Green professionals must move between spaces—UNFCCC halls, community meetings, and private-sector discussions. Stakeholder maps in any country show how many actors must work together. Turning this complexity into cooperation is the defining green skill of the future.

Ultimately, soft skills—collaboration, negotiation, advocacy, and stakeholder engagement—are what turn technical knowledge into real-world impact. Without them, even the best climate solutions remain unrealized.

Systems Thinking: The Iceberg Model

Systems thinking helps us understand that climate change is a systemic, not an isolated, issue. The Iceberg Model is a key tool for guiding this type of thinking, breaking down a problem into four levels to enable meaningful change.

- **Events:** The most visible level, representing "what just happened?" Examples include a new public policy or illegal deforestation being discovered. We tend to simply react to this level.
- **Patterns/Trends:** This level looks at "what trends have there been over time?". Examples include increasing pressure on governments or rising tensions between actors, which allow us to anticipate future events.
- **Underlying Structures:** This level explores "what has influenced these patterns?" and the relationships between different parts of the system. Examples include the power of large companies or economic incentives to clear land, which enables us to design new solutions.
- **Mental Models:** The deepest level, which asks, "what assumptions, beliefs, and values do people hold about the system?". This is where true transformation can be achieved by addressing beliefs like "we must make a profit at any cost".



Workshop 3 : Digital Green Skills



Overview

Digital tools are essential for addressing the complex, fast-moving, and global challenges of climate change. Digital skills from **Artificial Intelligence (AI)** to **data science** to **Internet of Things (IoT)** can be used for climate mitigation and adaptation. They also offer a precise, real time, and automated solution to complex climate change issues, scaling solutions across cities, sectors, and borders, coupled with the role of youth at the forefront of this technological revolution utilizing tools, from local digital mapping to open source climate dashboards, to shape the future of climate action.

Key Digital Green Skills

While a wide range of digital green skills are emerging, three entry points for youth that are most rapidly growing are: Artificial Intelligence (AI), Intern IoT, and Data Science. Chosen for their impact, accessibility, and alignment with real-world job market trends. These three skills were chosen based on [LinkedIn's 2023 Green Skills report](#) and [WEF's Future of Jobs 2023 analysis](#), which show these as leading cross-sectoral digital competencies. green skills that are:

- **AI for Climate:** AI can predict extreme weather, detect land-use changes, optimize energy grids, and analyze climate data rapidly, enabling smarter climate decisions. For example, AI tools use satellite imagery for crop health analysis. However, AI's effectiveness depends on the data it's trained on, making inclusive data and ethical design crucial for equitable climate solutions.
- **IoT & Sensors:** The Internet of Things (IoT) is helping to sense a greener future. Sensors can monitor air quality, emissions, and pollution in real time. They are also used to detect water leaks, track usage to reduce waste, and identify energy spikes to improve grid efficiency. This technology is fundamental to building smart, sustainable cities and buildings.
- **Data Science for Green Finance:** Data science fuels green investments by quantifying sustainability and mapping climate risks across sectors and geographies. It informs ESG investing and offers predictive insights for resilience. Internships with ESG firms or open-source climate risk mapping projects are entry points for young professionals.

Youth-Led Climate Tech: A Case Study

Youth, particularly through innovative startups like TileGreen, are at the forefront of developing "tech-for-good" solutions. TileGreen, for example, utilizes a patented machine learning process to transform plastic waste into durable, environmentally friendly building materials. Their achievements demonstrate the powerful combination of innovation and robust support, underscoring the natural synergy between entrepreneurial spirit and the burgeoning green economy.

Career Pathways

The demand for green jobs is growing rapidly in several areas such as:

- **Green Finance & ESG:** With the surge in sustainable investment and mandatory ESG reporting across industries, there is increasing demand for analysts and strategists who can translate data into actionable impact metrics. Platforms like MSCI and S&P now offer entire ESG certification tracks.
- **AgriTech:** As climate change disrupts food systems, AgriTech is critical to resilience. There's rising demand for roles that combine tech (e.g., remote sensing, smart irrigation) with local innovation, especially in food-insecure regions.
- **Smart Cities:** Urban areas account for 70%+ of emissions. Cities are hiring IoT and efficiency experts to deploy sensor-based infrastructure, manage traffic emissions, and transition to net-zero operations—creating demand in urban planning, mobility, and data engineering.
- **Digital Policy & Media:** As AI governance and data privacy intersect with sustainability, there's growing demand for policy advisors, climate communicators, and digital campaigners who can tell compelling stories. Even the gaming industry is now being used as a medium for environmental education and systems thinking.

Fireside Chat #1 Outcomes: Reimagining the Workforce for a Green Digital Future

The fireside chat with Efrem Bycer, Head of Workforce and Climate Policy Partnerships at LinkedIn, served as a reality check and roadmap for how youth can actively shape and navigate the green digital economy. Drawing from LinkedIn's labor market data and policy work, Efrem provided powerful data-backed insights on the rise of green skills, the hidden opportunities in non-obvious green roles, and the importance of showcasing capabilities beyond job titles. His quotes below distill the essence of this critical shift:

“Roughly 1 in 6 workers has at least one green skill, we have a long way to go.”

“When we look at the people who are hired with green skills across the economy, there are 3 groups: People with green titles, people with green skills, and people with green skills and green titles. And interestingly, in the last couple years, we've noticed that the group with just green skills makes up the plurality of that segment, which means that what employers are hiring for are people with green skills in non-obvious green jobs.”

Efrem Bycer - Head of Workforce and Climate Policy Partnerships
@ LinkedIn

Efrem provided invaluable insights to youth navigating the intersection of digital skills and climate action such as:

- **The Rise of Green Skills:** LinkedIn's global data reveals a steady increase in demand for green skills across traditional industries and emerging sectors (e.g., green finance, renewable energy, sustainable design). Skills-first hiring is gaining prominence, with digital capabilities becoming as crucial as academic degrees.
- **Essential Skills for the Future:** AI, climate data, and digital storytelling are no longer niche but core competencies for future jobs. Mastery of both digital tools and climate understanding will position youth for leadership in the green economy.
- **LinkedIn as a Mirror and Map:** The platform reflects current job market trends and helps professionals chart career paths based on emerging opportunities.
- **Building an Adaptive Digital Identity:** Showcasing projects, certifications, and community impact to remain relevant and visible is highly encouraged.
- **Agency and Action:** Youth have the tools and networks to drive change through climate tech, policy, or media, fostering purpose-driven careers.

Fireside Chat #2 Outcomes: Gaming for Climate

Shayne Hayes, Founder of Cold Fusion Games, highlighted how gaming, AI and digital storytelling are reshaping the way youth engage with climate action. Rather than relying on fear-based messaging or overwhelming statistics, Shayne emphasized that games can activate empathy, agency and hope, which are key drivers of real-world behaviour change.

“Decades of environmental psychology research have demonstrated that just raising awareness of a problem and guilt-tripping people, essentially, into taking action doesn't work. Instead, we need to support Players' feelings of self-efficacy, or their feeling that they're able to take action, and that they're able to make an impact.”

“Games can play a really important role in helping players visualize what a sustainable future looks like.”

Shayne Hayes - Founder of Cold Fusion Games

Shayne provided invaluable insights to youth navigating the intersection of gaming and climate action such as:

- **Immersive Learning:** Games provide interactive environments for users to experiment with climate decisions and understand their outcomes in simulated settings. This active engagement is powerful for shaping behavior and understanding complex systems.
- **Real-World Impact:** Examples from Minecraft Education climate modules and the Climate Games Initiative demonstrate how games have already inspired action, from classroom learning to civic engagement.
- **Practical Application:** The session concluded with interactive demos of the Minecraft Climate Game and the Financial Times Climate Game, emphasizing the importance of systems thinking, trade-offs, and long-term strategy in developing climate solutions.

Workshop 4 : Future Green Skills for Emerging Industries



Overview

The industries of tomorrow demand a dynamic blend of technical prowess, essential soft skills, and cutting-edge digital competencies. However, a significant skills gap currently hinders our progress towards critical climate goals. To truly unlock a sustainable future and empower individuals for the careers that lie ahead, cultivating crucial green skills is not just important, it's absolutely essential.

Emerging Industries and Their Required Skills

Carbon Capture & Storage (CCS)

CCS works as a vacuum cleaner for emissions, capturing carbon dioxide (CO₂) from industrial sources like power plants, steel, and cement factories. The captured carbon can then be stored underground or reused in new products such as synthetic fuels or building materials. It is essential for achieving net-zero in hard-to-abate sectors, although it remains costly and energy intensive.

Applications & Case Studies: Mammoth Direct Air Capture and Storage Facility in Iceland & The Ravenna CSS in Italy.

Skills Needed:

- **Technical:** Chemical engineering, geology, and carbon accounting (MRV).
- **Digital:** AI, blockchain, and satellite monitoring for transparency and traceability.
- **Policy & Finance:** Climate finance, trading, and Paris Agreement Article 6 standards.
- **Social & Soft Skills:** Inclusion, communication, and negotiation for stakeholder engagement and community benefits.

Careers: Carbon Capture Engineer, Carbon Storage Analyst, CCS Project Manager, & Industrial Decarbonization Policy Advisor.

Hydrogen Energy

Green hydrogen is produced using renewable electricity to split water into hydrogen and oxygen through electrolysis. Unlike solar or wind, hydrogen is not intermittent, it can be stored, transported, and used for heavy industries such as steel, cement, and chemicals. It enhances energy security and grid flexibility but faces challenges like high production costs, infrastructure gaps, and water demand.

Applications & Case Studies: NEOM (Saudi Arabia): A \$8.4B joint venture producing 600 tonnes of green hydrogen per day, fully powered by 4 GW of solar and wind energy. Oman Green Hydrogen Plants (Dhofar): Two large-scale plants with combined investments of \$11B, aiming to produce over 300,000 tonnes of green hydrogen per year by 2030.

Skills Needed:

- **Technical:** Power generation and integration, electrolysis engineering, hydrogen storage and transport.
- **Safety & Logistics:** Handling flammability risks, leak detection, and cross-border logistics.
- **Digital:** AI-driven predictive maintenance and digital twin systems.
- **Policy & Standards:** Global certification, hydrogen codes, and safety regulations.

Careers: Hydrogen Systems Engineer, Hydrogen Safety Officer, Energy Storage Specialist, & Hydrogen Supply Chain Manager.

Bioengineering

Bioengineering combines biology, technology, and AI to design sustainable solutions for food, materials, and health. It creates climate-resilient crops, bio-based materials, and microbes that clean up pollution. This field connects genetics, material science, and ethics to promote sustainable development.

Applications & Case Studies: Water-Efficient Maize for Africa (WEMA): Developed drought-tolerant maize using CRISPR and bioengineering, improving yields by 35% for farmers in Kenya, Uganda, and Tanzania. Danimer Scientific (USA): Produces biodegradable PHA bioplastics using engineered microbes, now scaling up to 200,000 tonnes annually for brands like PepsiCo and Nestlé.



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Skills Needed:

- **Technical:** Biotechnology, synthetic biology, chemistry, and material science.
- **Digital:** AI in genomics and bioinformatics.
- **Ethical & Social:** Responsible innovation and public communication.

Careers: Climate Biotechnologist, Synthetic Biology Specialist, Bio-materials Designer, & Industrial Biotech Engineer.

Nature-Based Solutions (NbS)

NbS uses ecosystems, forests, wetlands, soils, and mangroves to address environmental and social challenges. They are cost-effective, resilient, and inclusive, combining traditional knowledge with modern science. They deliver multiple benefits: carbon capture, biodiversity conservation, and livelihood improvement.

Applications & Case Studies: UAE Mangrove Restoration: Targeting 100 million mangroves by 2030 for coastal protection and carbon sequestration. Kenya's Regenerative Agriculture: Boosted yields by 40% and reduced soil erosion through farmer-led soil restoration. China's Great Green Wall: Reforestation program restoring 66 billion trees and reducing sandstorms.

Skills Needed:

- **Technical:** Ecology, biodiversity restoration, soil and water management.
- **Digital:** GIS mapping, satellite monitoring, and AI for ecosystem tracking.
- **Community & Policy:** Indigenous collaboration, advocacy, and policy integration.

Careers: Ecological Restoration Specialist, GIS Analyst, NbS Project Manager, & Community Engagement Officer.

Climate Resilience

Climate resilience is the ability of societies, systems, and economies to anticipate, absorb, adapt, and recover from climate shocks. It's not just about building walls; it's about preparing people, infrastructure, and economies to thrive in a changing climate.

Applications & Case Studies: Bangladesh Cyclone Shelters: Reduced storm deaths by over 90% through early warning and community-based planning. Netherlands Delta Works: World-class flood protection infrastructure combining engineering and ecology. Egypt Climate-Smart Villages: Improved irrigation systems and reduced crop losses. Kenya Index-Based Insurance: Protects farmers from drought risks using data-driven risk modeling.

Skills Needed:

- **Technical:** Urban and infrastructure design, flood management, climate modeling.
- **Digital:** Data and GIS mapping, AI for predictive modeling, IoT for real-time monitoring.
- **Social & Governance:** Policy development, stakeholder engagement, and resilience finance.

Careers: Urban Resilience Planner, Disaster Risk Analyst, Climate Adaptation Specialist, & Resilience Finance Consultant.

Final Note: Building the Skills That Build the Future

Across all emerging industries, one truth stands out, **green skills are hybrid**. The future belongs to people who can merge **technical expertise, digital fluency, and human understanding**.

AI won't replace people, but those who can work with AI, lead with empathy, and adapt with agility will shape the world ahead. In a time of constant change, **flexibility and inclusivity** are not optional, they're survival skills.