POLICY BRIEF

Green Skills for Nature-based solutions – toward a resilient South Africa

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This policy brief highlights the importance of green skills for the effective design, implementation, and management of Nature-based Solutions (NbS). The brief targets higher education and professional sectors and offers actionable recommendations for these sectors, and for government and industry.

CONTEXT OF GREEN SKILLS IN SOUTH AFRICA

South Africa faces two critical, interconnected challenges: persistently high unemployment and the pressing need to transition to a green economy. National frameworks such as the *Green Economy Accord* and the *National Development Plan 2030* reflect the country's commitment to a low-carbon, resource-efficient future.

Specific green skills gaps threaten progress towards this vision. A needs assessment survey and interviews with higher education stakeholders and professionals as part of the Nature-based Solutions for African Resilience project (*https://www.ru.ac.za/nbs4afrres/*) identified a range of gaps in skills, including multidisciplinary methods, stakeholder engagement, and design options for Nature-based Solutions (NbS), among others. These gaps are exacerbated by the challenges of finance and implementation at scale, particularly in the context of climate adaptation and mitigation.

Green skills refer to the
knowledge, **abilities**, **values**, and **attitudes**
necessary to develop and support a
sustainable and resource-efficient society.

These skills are critical for mitigating environmental change and achieving ecological, economic, and social resilience, which are linked to various national policies and plans: the National Climate Change Response Policy (NCCRP), the Ecosystem-based Adaptation Strategy and implementation Plan 2025-2034, and South Africa's White Paper on Biodiversity Conservation and Sustainable Use.

WHAT ARE NATURE-BASED SOLUTIONS AND/OR ECOSYSTEM-BASED APPROACHES (NBS-EBA)

Nature-based Solutions and/or Ecosystem-based Approaches (Global Biodiversity Framework, Target 8 & 11) are actions that leverage natural systems and ecosystem services to address societal challenges, including adaptation to climate change, while also delivering benefits for ecosystems, communities, and economies (Department of Forestry Fisheries and the Environment [DFFE], 2024). EbA along with ecosystem-based mitigation fall under the umbrella of NbS. Turpie et al. (2023) highlights that an NbS measure must meet six criteria: alignment with natural ecosystem processes, benefiting biodiversity, adaptability, being locally appropriate, being multifunctional, and enhancing human well-being.

NbS and EbA play a crucial role in climate regulation, disaster risk reduction, biodiversity conservation, and water purification. As environmental risks intensify, NbS-EbA create multifunctional pathways that provide co-benefits, and they can be cost-effective for sustainable development in certain situations. Comprehensive global databases archiving the co-benefits and costs of locally relevant NbS-EbA options against traditional solutions are essential to make informed decisions and the integrated Cost-Benefit Analysis for NbS (*https://nbi.iisd.org/report/integrated-cost-benefit-analysis-for-nature-based-solutions/*) is a useful platform addressing this need.

To deliver these solutions at scale, a skilled workforce is required, and successful implementation relies on cross-sectoral collaboration, capacity-building, and a strong evidence base of the benefits versus costs of NbS implementation in South Africa (Department of Forestry, Fisheries and the Environment (DFFE), 2024; Strietska-Ilina et al., 2011). Higher Education Institutions (HEIs) and professional training programmes are central to building these capacities.

HOW IS THIS RELEVANT FOR SOUTH AFRICA?

Green skills in the South African job landscape

Green skills offer multiple opportunities in South Africa, especially in the context of a just transition to a low-carbon and resilient economy. As such green economy holds significant potential for job creation, but only if it is matched with relevant skills development. Research highlights a growing disconnect between the supply of skills and labour market demand in critical sectors (Ramsarup et al., 2017; Strietska-Ilina et al., 2011). This requires expediting alignment between environmental policies, skills planning and training to meet current and future demands for green skills.

Mainstreaming of NbS-EbA across various sectors, such as infrastructure development (including industry, transportation, and housing), utilities (water and energy), and the bioeconomy, is necessary to ensure that these concepts and skills are embedded in the curriculum for architecture, engineering, environmental sciences, and other built environment degrees. Green skills enable enhanced understanding and management of the technical, ecological, economic, and social complexities of NbS-EbA across various government priorities, such as investment, economics, employment, and infrastructure development. Bridging the skills gap requires reform across curricula, vocational training, and greater partnerships between policymakers, education providers, and industry.

Core green skills for NbS

To deliver NbS successfully, a range of practical, scientific, and social competencies are required.

Multidisciplinary collaboration and inclusive partnerships are critical for the successful implementation of NbS (van Ham & Klimmek, 2017).

Many education and training systems do not fully reflect these skills, thereby limiting workforce readiness for a greener, more resilient future. These gaps in skills and competencies were confirmed by a recent analysis using a mix of quantitative and qualitative methods (including over 250 online surveys and in-depth interviews) of students, academic staff, environmental professionals, engineers, government officials, and decision-makers across two African countries: South Africa and Senegal (*https://www.ru.ac.za/nbs4afrres/*).

CORE NbS COMPETENCIES IDENTIFIED BY SURVEY FOR BUILT ENVIRONMENT PROFESSIONALS

Ecosystem management, restoration, monitoring and evaluation

Climate change adaptation, mitigation and resilience

Stakeholder engagement and participatory planning approaches, including co-design and co-creation

NbS-EbA options associated with water sensitive urban design, sustainable stormwater management and sponge cities

NbS-EbA implementation, asset management and maintenance skills for infrastructure designers and gatekeepers of infrastructure development.

KEY OPPORTUNITIES

- Mainstream NbS in the immediate to short term in order to embed NbS across disciplines, including engineering and the built environment, natural sciences, economics, and social sciences.
- Co-create solutions with local government, civil society, and the private sector.
- Improve coordination between government, industry, and academia.
- Expand training programmes for professionals aligned with the National Climate Change Response Policy (NCCRP), and South Africa's White Paper on Biodiversity Conservation and Sustainable Use.
- Monitor the outcomes of training and implementation to support evidence-based scaling with associated business cases.
- Interdisciplinary and community-based, inclusive participatory approaches prioritised for teaching by HEIs to support equitable, resilient development.

KEY CHALLENGES

- Limited integration of green skills into sectoral and South African national policies.
- Outdated, siloed curricula with little emphasis on interdisciplinary and inclusive approaches.
- Limited opportunity for NbS integration in undergraduate curricula, specifically within engineering disciplines.
- Insufficient field-based experiential ('living lab') learning opportunities.
- Low institutional capacity and few incentives for curriculum innovation.

ACTIONABLE RECOMMENDATIONS FOR HIGHER EDUCATION AND TRAINING SECTORS

- Support curriculum innovation by integrating NbS, sustainability, and climate resilience into interdisciplinary programmes.
- Align academic programmes with labour market needs related to NCCRP, South Africa's White Paper on Biodiversity and Sustainable Use, and UN Sustainable Development Goals (SDGs).
- Align degree accreditation processes of professional registration bodies, such as the Engineering Council of South Africa (ECSA), with SDGs and appropriate national policies and strategies.
- Offer flexible, modular training for upskilling and reskilling professionals.
- Promote technical, relational, and transformational competencies for advancing the green economy.
- Build cross-sectoral partnerships between government, civil society, and industry.

PRIORITY RECOMMENDATIONS FOR GOVERNMENT, HIGHER EDUCATION AND INDUSTRY (NATIONAL AND CROSS-CUTTING)

- Promote green skills training aligned with national and global climate and development commitments.
- Strengthen public-private partnerships through internships, apprenticeships, and upskilling, especially for marginalised groups.
- Provide incentives for green enterprises to invest in training and employment.
- Establish a central NbS knowledge platform with local case studies and best practices.
- Develop robust NbS monitoring, evaluation and reporting systems using long-term, reliable data.

CONCLUSION

Nature-based Solutions offer a practical and impactful path to a climate-resilient and just society, but their success depends on human capacity. Pereira et al. (2025: DOI 10.1038/s41893-025-01652-3) highlight six (foundational, enabling and implementation) principles to ensure that natural climate solutions are appropriate for Africa's contexts and priorities. We recommend these six principles as the green skills highlighted in this policy brief speak directly to them. Green skills are the foundation for turning the vision of a low-carbon, resource-efficient and resilient society into reality. Higher education and professional development must be at the centre of this transformation, equipping both current and future generations with the knowledge and tools to lead South Africa's green transition.

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More information on the project is available at https://www.ru.ac.za/nbs4afrres/