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Deliverable 2.2

EU-Africa Green Skills frameworks (ESCO) and CDW existing training analysis for adoption in GROW

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Abstract	This deliverable analyses EU-Africa Green Skills Frameworks (ESCO), existing Construction and Demolition Waste (CDW) training programmes and practice examples of both continents to identify competencies, methodologies and best practices for the development and adoption of GROW's sustainable, demand-driven TVET curriculum in Nigeria and Mozambique.

Keywords	ESCO, Green Skills, C&D, Waste management, Circular Economy, Africa, EU, Vocational Education, Erasmus+

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DISSEMINATION LEVEL		
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SEN	Classified, information as referred to in Commission Decision 2001/844/EC	
CLASSIFIED R-EU / EU-R	EU RESTRICTED under the Commission Decision No2015/ 444	
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* **R:** Document, report (excluding the periodic and final reports)
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DEC: Websites, patents filing, press & media actions, videos, etc.
DATA: Data sets, microdata, etc.
DMP: Data management plan
ETHICS: Deliverables related to ethics issues
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EXECUTIVE SUMMARY

The construction sector is one of the largest generators of waste globally and simultaneously one of the sectors most exposed to skills shortages associated with the green transition. Sub-Saharan Africa is no exception to this trend; the rapid urbanisation of its cities has pushed the production of construction and demolition waste (CDW) to unprecedented levels, compounding social, economic and environmental challenges.

The GROW project aims to respond to these challenges by modernising and strengthening Technical and Vocational Education and Training (TVET) systems in Nigeria and Mozambique, through the integration of market-relevant green skills focused on CDW management, circular economy principles, sustainable entrepreneurship, green business development and digital waste monitoring competencies into vocational training programmes. In addition, industry-aligned certifications and public-private partnership mechanisms are two further areas that the project aims to promote.

The analysis concludes that while substantial progress has been achieved globally in green skills development, significant gaps remain in Sub-Saharan Africa. Existing TVET systems in Nigeria and Mozambique remain largely focused on traditional construction trades and insufficiently address its waste management sustainable practices.

To address these gaps, the deliverable highlights some training materials that have been produced and can be adapted for the GROW programme, and proposes a framework for adaptation and integration of ESCO-aligned competencies into GROW's pilot training programme, including technical modules on waste identification, selection and segregation, recycling technologies, digital tools for site monitoring, entrepreneurship and green business development. The report further recommends adopting modular, dual-language and blended learning approaches capable of supporting future accreditation and replication across African TVET institutions

The report benchmarks European and African practices in sustainable construction, circular economy and waste valorisation, analysing 12 international case studies and best practices—5 from Europe and 7 from Africa—that illustrate innovative approaches to circular construction, waste management, on-the-job learning, applied digital tools, and industry engagement. Given the limited focus on waste management in vocational training schools in Africa, more case studies from the African continent were intentionally examined than from Europe, in an effort to better align the pedagogical and practical content to be developed under the GROW initiative with the African reality.

This document complements the findings of deliverable D2.1 Training Needs Report. While D2.1 identifies the empirical gaps in skills and the training needs arising from consultations conducted in Nigeria and Mozambique, the present deliverable translates those needs into a more comprehensive skills and curriculum framework, linking them to ESCO's framework, CDW's existing training programs, and selected EU and Africa best practices.

Together, D2.1 Training Needs Report and D2.2 EU-Africa Green Skills frameworks (ESCO) and CDW existing training analysis for adoption in GROW will contribute to the technical and educational foundations necessary for the development of demand-driven training programs in the CDW management sector, where special attention will be given to work-based learning approaches, to blended learning formats capable of supporting future accreditations and replication in African VET institutions, as well as to inclusive pedagogical strategies aligned with the priorities of Erasmus+ and the EU-Africa Global Gateway framework.

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ABBREVIATIONS

AMOR	Associação Moçambicana de Reciclagem (Mozambican Recycling Association)
C&D	Construction and Demolition
CEDEFOP	European Centre for the Development of Vocational Training
CDW	Construction and Demolition Waste
D2.1	GROW Deliverable 2.1 Training Needs Report
DigComp	Digital Competence Framework for Citizens
E2.1	GROW Event E2.1 – Stakeholders' Workshop in Mozambique
E2.2	GROW Event E2.2 – Stakeholders' Workshop in Nigeria
EC	European Comission
ESCO	European Skills, Competences, Qualifications and Occupations
EU	European Union
EWC	European Waste Catalog
EWL	European Waste List
GROW	Construction Waste Remediation & Recycling Vocational Training in Sub-Saharan Africa
H&S	Health and Safety
ILO	International Labour Organisation
LAWMA	Lagos Waste Management Authority
OECD	Organisation for Economic Co-operation and Development
SRM	Second Raw Material
ToT	Train of Trainers
TVET	Technical & Vocational Education and Training
UN	United Nations
UNECA	United Nations Economic Commission for Africa
UNESCO	United Nations Educational, Scientific and Cultural Organisation
UNEVOC	Combination of 'UNESCO' and 'Vocational Education'
UNIDO	United Nations Industrial Development Organisation
VET	Vocational Education and Training
WBL	Work Based Learning

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1. INTRODUCTION

Construction and demolition activities are among the world's largest sources of waste and are key contributors to carbon emissions. According to the European Commission and several international circular economy studies, CDW accounts for approximately 30–40% of total solid waste generated worldwide. At the same time, the construction industry is increasingly affected by green transition policies that require new technical competencies linked to resource efficiency, sustainable materials, digital monitoring systems, and circular construction models.

Based on the specific training needs of each country identified in D2.1, this document provides the appropriate competency and reference framework for translating those needs into curriculum design options for the GROW training course on "Sustainable Management of Construction and Demolition Waste."

The report analyses the ESCO Green Skills and Knowledge Concepts classification and benchmarks European and African vocational training initiatives in sustainable construction, circular economy and waste valorisation. The purpose is to identify transferable methodologies, technical competencies and pedagogical approaches suitable for adaptation into GROW's dual-language training programme.

This deliverable supports the curriculum development activities by analysing:

- Findings from D2.1 Training Needs Report;
- European and African green skills frameworks;
- ESCO green skills taxonomies;
- Existing CDW training initiatives;
- Circular economy learning approaches;
- Transferable good practices suitable for Nigeria and Mozambique.

The deliverable further contributes to the alignment of GROW with EU Green Transition priorities, the EU-Africa Global Gateway Strategy, Agenda 2063 and national sustainability frameworks in Nigeria and Mozambique.

2. OBJECTIVES

The main objective of this deliverable is to provide an evidence-based analysis supporting the adaptation and development of GROW's green skills curricula for sustainable CDW management.

Specific objectives include:

1. Analyse European and African green skills policy frameworks relevant to construction waste and circular economy;
2. Review the ESCO framework and identify relevant occupations and competencies for sustainable CDW management;
3. Map existing VET initiatives related to CDW;
4. Propose curriculum adaptation priorities for Mozambique and Nigeria, in line with the skills gaps identified and emerging occupational needs in both countries;
5. Benchmark best practices, innovative pedagogical methodologies and curricula structures applicable to GROW;
6. Provide recommendations for the design of GROW's modular training programmes;
7. Support future accreditation and scalability of GROW training modules;
8. Outline an Action Plan for connecting with entities involved in similar activities.

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3. METHODOLOGY

The methodology used for this deliverable is aligned with the **ADDIE** framework (Analyse, Design, Develop, Implement, Evaluate) adopted by the GROW project, particularly the "**Analyse**" phase. The purpose of this phase was to identify relevant green skills frameworks, existing CDW-related training programmes, competency standards and transferable good practices that can support the future development of the GROW training course and pilot training programme

The analysis followed a mixed desk-based and comparative approach, combining:

- **Literature review of policy frameworks**, technical reports and strategic documents related to green skills, circular economy, sustainable construction and waste management;
- **Assessment of green skills frameworks** relevant to Africa and Europe, including TVET modernisation priorities, circular economy strategies and labour-market-oriented skills policies;
- **Review of ESCO occupational profiles, skills and knowledge concepts** relevant to construction and demolition waste management, circular economy, digital monitoring, environmental compliance and green entrepreneurship;
- **Benchmarking of EU-funded projects and vocational training methodologies** related to CDW management, sustainable construction and circular economy;
- **Comparative analysis of TVET curricula, training programmes and competency standards** that could inform the design of GROW's modular training programme;
- **Review of best practices in the construction and waste management sectors** in both Europe and Africa, with attention to circular construction, material recovery, recycling, digital tools, work-based learning and industry engagement.
- **Integration of evidence from previous project activities**, especially the stakeholder consultations, interviews and training needs analysis carried out under D2.1.

The selection of sources, programmes and case studies was based on a set of relevance and transferability criteria. Priority was given to initiatives that were directly related to **construction and demolition waste management, circular economy, green skills development, TVET curriculum design, digital or work-based learning approaches,** and **green employment opportunities**. Particular attention was also given to examples with potential transferability to the realities of **Nigeria and Mozambique**, either because they address similar operational challenges or because they offer practical methodologies that can be adapted to African TVET institutions.

The analysis therefore considered not only the technical relevance of each framework or practice, but also its potential contribution to the future GROW training pathway. This included the extent to which each example could support the development of **learning outcomes, practical training modules, trainer upskilling activities, industry cooperation mechanisms, digital competences,** and **inclusive employment-oriented approaches**.

Finally, the findings were cross-checked against the training needs identified in **D2.1 – Training Needs Report**, in order to ensure that the proposed frameworks, competencies and practices respond to real institutional and labour market needs in Nigeria and Mozambique. This triangulation allowed the deliverable to move beyond a generic review of green skills frameworks and to provide a more targeted basis for the design of a **practical, modular and context-sensitive GROW curriculum**.

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4. EU-AFRICA GREEN SKILLS FRAMEWORKS

4.1 European Green Skills Framework

The European Union has progressively integrated green transition priorities into vocational education and labour market policies.

Central frameworks include:

- **European Green Deal**[1] - EU's strategic plan, launched in 2019, that aims to achieve climate neutrality by 2050 and reduce greenhouse gas emissions by at least 55% by 2030, compared with 1990 levels. Its main objectives are modernising the EU's economy, energy systems, transport and industries, whilst ensuring environmental protection, economic growth and social justice, in an effort to ensure a sustainable future for all EU citizens;
- **Circular Economy Action Plan**[2] - a cornerstone of the European Green Deal, aiming to decouple economic growth from resource use. It targets the entire lifecycle of products, from design and production to consumption, reuse, and recycling, ensuring that materials remain in circulation for as long as possible;
- **Circular Economy Act**[3] – set to be adopted in 2026, aims to double circularity rate[4] from 12% to 24%, namely by establishing a Single Market for secondary raw materials, increase the supply of high-quality recycled materials and stimulate demand for these materials. In short, pave the way to a resource-efficient, low-waste and climate-neutral economy;
- **Pact for Skills**[5] - A European initiative whose main objective is to encourage public and private organisations to invest in upskilling the workforce, thereby supporting the digital and green transitions;
- **DigComp**[6] (Digital Competence Framework for Citizens) - a reference framework developed by the European Commission to help citizens, educators, and organisations understand and develop essential digital skills;
- **European Skills Agenda**[7] - Comprehensive strategy, launched by the EC, to ensure that EU citizens are equipped with the right skills for sustainable competitiveness, the green and digital transitions, and economic recovery, establishing ambitious goals for lifelong learning like, for example, that 60% of adults participate in training every year by 2030.
- **ESCO**[8] - European Skills, Competences, Qualifications and Occupations - This framework has been selected as having broad relevance to the achievement of the objectives set out in the GROW project; consequently, the scope of its application will be addressed throughout this deliverable.

In this study, we have deliberately focused on **ESCO**, as we have concluded that it is the framework that best suited to the needs identified in the two target countries, Nigeria and Mozambique, in terms of both qualifications and occupations.

The European Skills, Competences, Qualifications and Occupations (ESCO) framework provides a structured and **multilingual taxonomy of occupations and skills** relevant for green jobs and sustainable construction supporting labour market alignment and vocational education modernisation.

Recent ESCO developments introduced specific **green skill labels** associated with environmental sustainability, recycling, waste management, energy efficiency, and sustainable building practices.

[1] https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal_en

[2] https://circolareconomy.eu/wp-content/uploads/2025/12/Circular-economy-action-plan-for-Europe_En.pdf

[3] https://environment.ec.europa.eu/strategy/circular-economy_en

[4] This number shows how much of the materials we use are recycled or reused instead of being thrown away

[5] https://pact-for-skills.ec.europa.eu/

[6] https://digital-skills-jobs.europa.eu/en/initiatives/european-initiatives/digital-competence-framework-digcomp

[7] https://employment-social-affairs.ec.europa.eu/policies-and-activities/skills-and-qualifications/european-skills-agenda_en

[8] https://esco.ec.europa.eu

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Within GROW, **ESCO Green Skills Concepts** provide a reference framework for identifying competencies required in sustainable construction and circular CDW management.

The report also identifies alignment opportunities between ESCO competencies and African green transition priorities, particularly under Agenda 2063 and Global Gateway green economy objectives.

4.2 African Green Skills Frameworks

African green skills frameworks are increasingly shaped by continental development agendas and regional strategies that place strong emphasis on youth employment, TVET modernisation, industrial transformation, circular economy and sustainable development.
Relevant frameworks include:

- **African Union Agenda 2063**[9] - African Strategic framework, that outlines a 50-year developmental trajectory aimed at achieving inclusive and sustainable socio-economic growth, namely People-Driven Development, by fully empowering the youth and women, and ensuring access to quality health and education;
- **African Continental Free Trade Area (AfCFTA)** [10] - One of the flagship projects of Agenda 2063, it represents the world's largest free trade area, bringing together the 55 countries of the African Union (AU) and eight (8) Regional Economic Communities (RECs) aiming at the creation of a single continental market to transform the continent into a global power;
- **African Union Continental TVET Strategy 2025-2034** [11] - heavily aligned with the AU's Agenda 2063, it is a transformative plan designed to modernise and harmonise Technical and Vocational Education and Training (TVET) across Africa. Its aim is to shift the focus away from the traditional search for employment and instead equip young people with entrepreneurial, digital and green skills, in order to promote sustainable economic development;
- **UNECA** (UN Economic Comission for Africa)[12] - Circular Economy Transition Framework having Sustainable Development as one of its key actiities;
- **ILO (International Labor Organisation)** [13] - specialized UN agency whose primary mission focuses on "Decent Work" for all women and men namely through the promotion of greater economic and employment opportunnities;
- National Green Economy Strategies.

The World Bank, and UNIDO[14] (United Nations Industrial Development Organization) highlight that green construction and waste management are priority sectors for future employment growth in Africa.

These frameworks are directly relevant to GROW because they confirm the need to strengthen African TVET systems so that they can respond to emerging labour market needs linked to the green transition. In countries such as **Nigeria and Mozambique**, rapid urbanisation and construction growth are creating increasing demand for new professional profiles in sustainable construction, waste management, recycling, material recovery, environmental compliance and circular economy entrepreneurship.

4.3 Common Findings

An analysis of all these frameworks leads to some common conclusions, which underscores the importance of projects such as GROW by reaffirming that:

a) the rapid urban growth currently taking place in Nigeria and Mozambique is generating a **growing demand for**:
   - Sustainable construction workers;
   - Waste sorting technicians;
   - Waste management experts;
   - Recycling operators;
   - Circular economy entrepreneurs.

[9] https://au.int/sw/node/31456
[10] https://www.africatradefoundation.org/the-afcfta
[11] https://au.int/sites/default/files/documents/44941-doc-AU_TVET_2025-2034_Strategy_ENGLISH.pdf
[12] https://africacircular.org/continental-action-plan-for-circular-economy-in-africa-2024-2034/
[13] https://webapps.ilo.org/
[14] https://www.unido.org/our-priorities/sustainable-supply-chains

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b) **green skills development** must be **connected to practical labour market needs** and to the realities of **local economies**. For GROW, this means that the curriculum should not simply address the need for cross-border knowledge exchange by importing European models, but rather by adapting international competency references to African contexts, taking into account **local infrastructure**, **informal waste value chains**, **regulatory environments**, available technologies and the capacity of TVET institutions.

This is consistent with the findings of **D2.1 – Training Needs Report**, which confirmed that Nigeria and Mozambique require stronger TVET responses to CDW management. In Nigeria, the priority is to reinforce practical and sector-specific competences in a field that already exists operationally but remains weakly formalised. In Mozambique, the priority is to build a stronger foundational base, using local examples and progressive learning pathways to introduce CDW management, circular economy principles and environmental compliance.

Overall, the main implication for GROW is that the future curriculum should combine **international competency references**, especially ESCO, with **African policy priorities** and the **country-specific needs identified in Nigeria and Mozambique**. This approach will help ensure that the training programme is both internationally aligned and locally applicable, while supporting employability, green skills development and stronger cooperation between TVET institutions, public authorities and companies.

4.4 Relevance of the EU and African Frameworks for GROW Curriculum Design

The relevance of each of the aforementioned European and African competency frameworks to the development of the GROW training course on "Sustainable Management of C&D Waste" is summarized in the following table:

TABLE 1: RELEVANCE OF THE FRAMEWORKS FOR CURRICULUM DESIGN

Framework	Relevance for GROW	Contribution for Curriculum design
European Green Deal	Provides the overall EU policy framework for the green transition and resource efficiency	Reinforces the need for training on sustainable construction, waste reduction and environmental responsibility
Circular Economy Action Plan	Promotes reuse, recycling, material recovery and reduced landfill dependency	Supports modules on CDW valorisation, circular construction and secondary raw materials
Circular Economy Act	Estimulates demand for secondary raw materials, recycled materials and low waste economy	Highlights the importance of modules addresing Circular Economy principles
Pact for Skills; European Skills Agenda	Promotes labour market relevance, upskilling and reskilling opportunities for all citizens, men and women	Supports the focus on employability, workers upskilling, lifelong learning and inclusiveness
DigComp	Defines digital competences relevant to learners, workers and educators	Supports training on digital reporting, data collection, monitoring tools and traceability
ESCO	Provides occupational profiles, skills and knowledge concepts.	Can guide learning outcomes, competence mapping and future certification pathways
AU Agenda 2063; AU TVET Strategy	Frames African priorities for skills development, youth and women employment and TVET modernisation	Helps adapt the curriculum to African socio-economic and institutional realities.

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AfCFTA	Sets the basis for creating a single continental market	It underscores the importance of the scalable GROW training program through the cross-border exchange of knowledge
UNECA	Promotes circular economy transition across African economies.	Supports locally relevant content on reuse, recycling, circular value chains and green entrepreneurship.
ILO	Promotes "Decent Work" for all men and women through greater employment opportunnities	Recognizes the need for content addressing, in an inclusive manner, the transition to new economic trends, including the digital transition, the circular economy, and waste management
National Green Economy Strategies	Provide country-level policy orientation for sustainability and green employment.	Help contextualise GROW training in Nigeria and Mozambique and support future stakeholder engagement.

5. ESCO GREEN SKILLS AND KNOWLEDGE CONCEPTS RELEVANT TO GROW

5.1 Introduction

The transition towards greener economies has significantly reshaped vocational education and labour-market policy across both Europe and Africa. Rapid urbanisation, resource depletion, and increasing waste generation have intensified the need for new forms of vocational training capable of preparing workers for sustainable industries and circular economy models. Within this context, the European Skills, Competences, Qualifications and Occupations (ESCO) framework has emerged as one of the European Union's most influential tools for defining and classifying green skills, knowledge concepts and occupations.

The GROW project is closely aligned with this broader transformation agenda and intends to align its training modules with ESCO in order to ensure relevance to labour-market needs and international competency standards.

Building on the training needs identified in D2.1 (Training Needs Report), this section uses ESCO as a reference framework to translate the skills gaps observed in Nigeria and Mozambique into structured competences, occupational profiles and competence-based modules for the future GROW curriculum.

In short, this report analyses the ESCO Green Skills and Knowledge Concepts, most relevant to the GROW programme. More specifically, it examines how ESCO can support curriculum development, labour-market alignment, digital transformation, entrepreneurship, and sustainable construction and demolition waste (CDW) practices within the specific context of Nigeria and Mozambique.

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5.2 Understanding ESCO and Green Skills

ESCO, developed by the European Commission, is a **multilingual classification system**[15] connecting occupations with the skills, competences, and knowledge required to perform them effectively. The framework was designed to improve labour-market transparency, mobility, and educational alignment across Europe, but its application increasingly extends into international cooperation and TVET modernisation initiatives.

ESCO distinguishes between **three major dimensions**:

1. Occupations**;**
2. Skills and competences;
3. Knowledge concepts.

Skills and competences refer to the practical and behavioural abilities required to perform occupational tasks, while **knowledge concepts** refer to the theoretical and technical understanding underpinning professional practice. It is worth noting that ESCO tackles language barriers by providing **terms** for each **concept** in all languages covered by the classification

In recent years, ESCO has increasingly integrated green skills[16] into **occupational classifications**. This reflects the reality that sustainability is no longer confined to specialised environmental professions; rather, environmental competencies now cut across multiple sectors, including construction, logistics, manufacturing, agriculture, transport, and waste management.

ESCO defines **green skills** based on the definition proposed by Cedefop[17] (European Centre for the Development of Vocational Training): *"the knowledge, abilities, values and attitudes needed to live in, develop and support a society which reduces the impact of human activity on the environment"*.

For GROW, this is particularly important because the project addresses one of the sectors most directly affected by sustainability transformation: the construction industry and its waste management. Construction and demolition waste poses a major environmental challenge in Nigeria and Mozambique, but it also represents economic potential within the context of a circular economy.

5.3 ESCO Green Skills relevant to GROW

ESCO therefore provides a structured methodology for identifying the competencies required to transform traditional construction occupations into green occupations, structuring training modules, identifying occupational profiles and supporting future certification or micro-credential pathways

However, ESCO must be used as an adaptable reference framework, not as a framework to be transferred directly without contextualisation. This is important because D2.1 showed that Nigeria and Mozambique have different starting points: Nigeria has more operational CDW practices but weak formalisation, while Mozambique needs a stronger foundational and contextualised approach.

ESCO should therefore be understood as a reference framework to guide curriculum design, rather than as a model to be applied mechanically. Its value lies in helping the project translate the skills gaps identified in Nigeria and Mozambique into structured learning outcomes, occupational profiles and competence-based modules. At the same time, these ESCO references will need to be adapted to the local realities of both countries, including informal waste value chains, different levels of institutional readiness, available technologies and national regulatory contexts.

[15] ESCO provides descriptions of 3,039 occupations and 13,939 skills linked to these occupations, translated into 28 languages (all official EU languages plus Icelandic, Norwegian, Ukrainian, and Arabic): https://esco.ec.europa.eu/en/about-esco/escopedia/escopedia/esco-languages

[16] In response to the European Union's goal of achieving climate neutrality by 2050, ESCO introduced green skills certification in January 2022 (https://esco.ec.europa.eu/en/about-esco/escopedia/escopedia/definition)

[17] An EU agency, founded in 1975 and based in Greece, which supports the Commission and Member States in developing appropriate European policies on vocational education and training.

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5.3.1 Sustainable Construction Waste Management

Existing TVET programmes in **Nigeria and Mozambique** include construction-related **training**, but they do **not yet systematically integrate specialised content on C&D waste** reduction, recycling, resource optimisation and waste management. As highlighted in D2.1, this gap is particularly relevant because stakeholders in both countries identified CDW management as an emerging field requiring stronger practical, technical and labour-market-oriented training.

ESCO includes several green skills directly relevant to these gaps, including:

- waste management;
- waste prevention;
- waste reduction techniques;
- recycling operations;
- resource efficiency;
- materials recovery;
- waste segregation;
- environmental compliance and monitoring;
- hazardous waste handling.
-

These competencies are central to the GROW curriculum, particularly in modules dedicated to selective demolition, C&D waste sorting, material recovery, recycling logistics, and circular waste-management systems.

Through ESCO alignment, GROW can standardise these competencies according to internationally recognised occupational profiles. This improves curriculum quality, particularly for modules dedicate to waste, while also enhancing the employability of graduates within regional and international labour markets.

5.3.2 Circular Economy Competences and Knowledge Concepts

Principles of the circular economy are one of the most important thematic areas, serving as the cornerstone for sustainable management of construction and demolition waste by promoting a shift away from linear “extract-manufacture-dispose” construction systems toward circular models based on reuse, recycling, and waste recovery.

Relevant ESCO green skills include:

- applying circular economy principles;
- investigating contamination for hazardous waste handling;
- managing recyclable materials;
- operating recycling processing equipment;
- promoting sustainable resource consumption;
- promoting the adoption of sustainable materials and components;
- evaluating material life cycles;
- training staff on recycling programmes;
- implementing waste-to-value strategies;
- conducting environmental impact assessments.

ESCO also includes knowledge concepts linked to:

- life-cycle assessment;
- sustainable materials;
- environmental sustainability;
- industrial ecology;
- resource optimisation;
- circular production systems.

These competencies directly support GROW’s ambition to transform CDW into economic opportunities. By embedding ESCO circular economy competencies into its TVET programme, GROW can ensure that learners understand not only practical recycling processes but also the broader environmental and economic logic of circular systems.

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5.3.3 Selective Demolition and Material Recovery

Traditional demolition methods often maximise waste generation and minimise material recovery. GROW instead promotes selective demolition practices aimed at preserving reusable and recyclable materials.

In this particular field, ESCO includes skills related to:

- dismantling structures safely;
- identifying reusable materials;
- sorting demolition waste;
- managing recovery operations;
- complying with environmental regulations;
- reducing environmental impact during construction processes.

These competencies are particularly important because selective demolition requires workers to combine technical construction expertise with environmental awareness and resource management capabilities.

ESCO knowledge concepts relevant to this area include:

- building materials science;
- structural systems;
- environmental engineering;
- recycling technologies;
- occupational health and safety.

This integrated skills framework is extremely valuable to GROW, as the project aims to bridge the gap between traditional training in the construction sector and the new sustainability requirements.

5.4 ESCO Digital Green Skills and Technological Innovation

Digital competences and modern monitoring technologies are still insufficiently integrated into existing TVET programmes in Nigeria and Mozambique, which represents a key area for improvement in the future GROW curriculum.

ESCO is highly relevant here because green transitions increasingly depend on digital transitions. Modern waste management systems rely heavily on data analysis, remote sensing, smart logistics, and automated monitoring systems.

Relevant ESCO digital green skills include:

- operating drones;
- using digital monitoring systems;
- analysing environmental data;
- applying information technologies in waste management;
- using cloud-based collaboration tools;
- implementing smart technologies for resource efficiency.

Based on the results of the deliverable D2.1 Training Needs Report, which reflects the specific realities of Nigeria and Mozambique, it is worth clarifying here that drones and advanced technologies should be presented as future-oriented examples, while the core training should start with more accessible tools such as mobile data collection, spreadsheets, GPS-based reporting and digital traceability.

ESCO knowledge concepts relevant to these technologies include:

- digital communication systems;
- environmental data management;
- remote sensing technologies;
- automation systems;
- digital mapping.

The integration of these competencies into GROW, with the necessary adaptations to countries specific realities, is strategically important because it prepares and awares learners not only for current labour market needs but also for future technology-driven occupations in sustainable construction and environmental management.

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5.5 ESCO Entrepreneurship Skills and Green Employment

Sustainability transitions increasingly require entrepreneurial competencies because many green jobs emerge through SMEs, start-ups, and informal innovation ecosystems rather than large corporations alone.

To support the emergence of potential new businesses, the GROW Consortium includes a business incubator equipped to support entrepreneurial initiatives in the field of construction waste recycling and initiatives related to the circular economy.

In turn, the ESCO programme includes numerous cross-cutting skills related to entrepreneurship and business innovation, including:

- business planning;
- market analysis;
- project management;
- stakeholder engagement;
- financial management;
- innovation management;
- sustainable business development.

ESCO therefore supports GROW not only in developing technical environmental competencies but also in fostering economic self-sufficiency and green enterprise creation.

Ultimately, GROW aims to equip trainees not only with technical competences in CDW management, but also with the entrepreneurial skills needed to transform waste into marketable resources and develop small-scale initiatives in material recovery, recycling services and green construction solutions. This also addresses the needs identified in D2.1, where green entrepreneurship was highlighted as a relevant transversal competence for improving employability and supporting local circular economy opportunities.

5.6 ESCO Occupational Profiles

One of ESCO's most important functions is to ensure alignment with the labour market, which is a particular asset given that both Nigeria and Mozambique present links between industry and education that need to be strengthened, as well as a certain level of mismatch between vocational training and the needs of the labour market.

ESCO helps address this problem by connecting occupational profiles directly with skills and knowledge requirements. This allows training providers to:

- identify emerging occupations;
- update curricula systematically;
- improve certification systems;
- align learning outcomes with industry expectations.

In this context, ESCO classifications define occupational profiles such as:

- Construction Waste Management Technician;
- Waste Auditing Technician;
- Digital Waste Monitoring Technician;
- Circular Construction Supervisor;
- Circular Economy Specialist;
- Recycling Operations Supervisor;
- Sustainability Compliance Officer;
- Green Construction Entrepreneur;

Even though this standardisation is valuable in Nigeria and Mozambique, where the absence of recognised qualifications in construction waste management acts as a barrier to career progression, when taking D2.1 findings into account, these profiles should be adapted to each national context: in Nigeria, with stronger emphasis on operational compliance, reporting and site-based waste management; and in Mozambique, with stronger emphasis on foundational environmental management, local reuse practices and gradual professionalisation of CDW-related roles. Especially in Mozambique, stakeholders suggested

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that an excessively narrow "construction waste technician" profile may be less employable than a broader profile linked to environmental management on construction sites.

A more realistic list that better reflects the labor market needs identified in Nigeria and Mozambique—resulting from the adaptation of the ESCO core list—would be the following, featuring complementary/emerging profiles:

- Construction and Demolition Waste Management Technician
- Environmental Management Technician for Construction Sites
- Waste Sorting and Material Recovery Technician
- Recycling Operations Supervisor
- Digital Waste Monitoring and Reporting Technician
- Environmental Compliance and Health & Safety Assistant
- Green Construction Entrepreneur

For GROW, this is particularly relevant, as ESCO-based curriculum design can contribute to more transparent certification systems and stronger labour-market recognition for graduates.

5.7 Challenges

Despite its strengths, applying ESCO within African TVET contexts also presents challenges.

First, ESCO was developed primarily for European labour markets and may require contextual adaptation for Nigeria and Mozambique. Informal labour markets, infrastructure limitations, and local regulatory systems differ significantly from European contexts.

Second, some occupations central to African waste economies may not yet be fully represented within ESCO classifications. Informal recycling workers, community waste entrepreneurs, and hybrid occupations common in developing economies may require local adaptation and contextualisation.

Third, effective implementation depends on institutional capacity. Training providers require substantial support to integrate competency-based learning approaches, digital tools, and industry collaboration mechanisms.

These challenges are consistent with the findings of D2.1 for the project target countries, which showed that Nigeria and Mozambique have different starting points in CDW management. While Nigeria requires stronger formalisation and operational upskilling, Mozambique requires a more foundational and contextualised approach. For this reason, ESCO should be used as a flexible reference for curriculum design, rather than as a rigid framework to be applied uniformly across both countries.

However, GROW is aware of these challenges, emphasising stakeholder engagement, public-private partnerships, local needs analysis, and adaptation to national contexts. This means that ESCO should be used flexibly and adapted to local contexts, rather than applied rigidly.

5.8 Main Benefits of implementing the ESCO Skills Framework in GROW

The ESCO framework provides a highly relevant foundation for the GROW programme because it connects green skills, occupational profiles, and knowledge concepts within a coherent labour-market-oriented system. GROW's objectives — sustainable construction waste management, circular economy training, digital innovation, entrepreneurship, and employability — align closely with the competencies embedded within ESCO's green skills architecture.

ESCO is particularly valuable for GROW because it enables the **standardisation** and **modernisation of TVET curricula** while supporting **labour-market relevance** and international cooperation. Through ESCO-aligned competencies, GROW can equip learners in Nigeria and Mozambique with skills related to recycling, selective demolition, waste valorisation, digital monitoring technologies, environmental compliance, and green entrepreneurship. This is particularly relevant for ensuring that the **training is not only technically sound, but** also **recognisable, transferable** and **aligned with labour market expectations**.

Moreover, ESCO supports GROW's broader ambition of transforming **construction waste** from an environmental burden into a source of **economic opportunity** and **sustainable employment**. By

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combining technical competencies, digital innovation, and entrepreneurial capabilities, the programme contributes not only to environmental sustainability but also to **inclusive economic development** and workforce transformation.

Ultimately, the relationship between ESCO and GROW demonstrates how international competency frameworks can support **local green transitions** when adapted thoughtfully to regional realities and labour-market conditions.

6. CONSTRUCTION AND DEMOLITION WASTE TRAINING LANDSCAPE ANALYSIS

This section examines the landscape of CDW's management training programmes, highlighting examples from both Europe and Africa. By cross-referencing the analysis of these programmes with the findings of deliverable D2.1Training Needs Report, areas are identified where these programmes still have scope to improve their training provision.

6.1 Examples of Existing Training Programmes

The following table provides some examples of technical and vocational training programmes relating to construction and demolition waste, their main focus, and also the method of delivery.

TABLE 2: EXAMPLES OF EXISTING CDW TRAINING PROGRAMMES

Programme	Region	Main Focus	Delivery Method
CDWaste-ManageVET[18]	Europe	CDW management and circular economy	Online + blended
Construction Blueprint[19]	Europe	Circular construction and digitalisation	Modular TVET
Green Growth Project[20]	Europe	Circular construction training	Modular TVET
APODISSI Digital Skills Assessment[21]	Africa	Assessment of digital skills gaps among Micro-SMEs in construction and green sectors across ten Nigerian states	E-learning platform + blended
DIGILOGIC[22]	Africa-EU	Digital innovation and entrepreneurship	E-learning Platform
UNEVOC Green TVET[23]	Africa	Sustainable TVET systems	Policy + institutional

[18] https://cdwaste-managevet.com/projects-outputs/; https://cdwaste-managevet.com/courses/; https://cdwaste-managevet.com/wp-content/uploads/2022/06/last-version-IO2-final-26.5.22-_ACs.pdf

[19] https://constructionblueprint.eu/training-curricula/

[20] https://greengrowthproject.eu/en/green-growth-en/; https://greengrowthproject.eu/en/courses/

[21] https://apodissi.com https://dtcnigeria.com/wp-content/uploads/2025/03/Final-Updated-Characterisation-and-Digital-Maturity-Assessment-of-MSMEs-in-Nigeria_Illustrated-Report.pdf; https://dtcnigeria.com/wp-content/uploads/2025/03/Final-Updated-Characterisation-and-Digital-Maturity-Assessment-of-MSMEs-in-Nigeria_Illustrated-Report.pdf

[22] https://digilogic.africa/

[23] https://www.unevoc.unesco.org/en/greening-tvet

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6.2 Scope for improvement in CDW management training

An analysis of CDW training programs in Europe and Africa reveals a common trend indicating room for improvement in training in the following areas of expertise:

Technical Skills

- Waste identification and sorting;
- Recycling and reuse techniques;
- Material recovery processes;
- Pre-demolition auditing;
- Sustainable demolition techniques;
- Hazardous waste management;
- Sustainable construction materials.

Digital Skills

- Smart waste tracking;
- Data collection and reporting;
- Digital environmental monitoring;
- Drone applications for construction monitoring.

Transversal Skills

- Entrepreneurship;
- Occupational health and safety;
- Teamwork;
- Environmental awareness;
- Circular economy business models;
- Communication skills.

GROW highlights the irrefutable importance of digital innovation and blended learning methodologies through integration with the Smart Step eLearning platform.

7. GAPS ANALYSIS AND TRAINING NEEDS IDENTIFICATION FOR GROW ADOPTION

This section is intended solely to summarise the findings of deliverable D2.1 that contribute to the analysis in this report.

7.1 Skills Gaps identified

The analysis identified several priority gaps in Nigeria and Mozambique, based on previous project activities aimed at identifying skills gaps in the construction sector's value chain and the training needs of TVET schools:

TABLE 3: PRIORITY SKILLS GAPS IDENTIFIED FOR NIGERIA AND MOZAMBIQUE

Area	Gap Identified
CDW regulation	Limited specialised training Low compliance and weak Enforcement
Recycling operations	Low technical capacity
Circular economy awareness	Limited integration in TVET
Digital skills	Low use smart technologies
Entrepreneurship	Weak green business development skills
Occupational safety	Inconsistent implementation
Trainer capacity	Limited exposure to modern circular economy practices

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7.2 Institutional Challenges

Identified structural barriers:

- Limited access to specialised training infrastructure;
- Insufficient industry-TVET collaboration;
- Limited certification frameworks;
- Lack of harmonised competency standards;
- Weak integration of circular economy topics in curricula.

7.3 Opportunities for GROW

GROW can address these gaps through:

- ESCO-aligned competency structures;
- Modular and micro-credential training;
- Industry partnerships;
- Work-based learning;
- Blended learning approaches;
- Digital learning platforms;
- Train-the-trainers models.

8. EUROPEAN BEST PRACTICES AND CASE STUDIES

Across much of Europe, construction and demolition (C&D) waste management is regulated through comprehensive environmental legislation, supported by established recycling infrastructure and increasingly stringent sustainability targets.

Although performance varies between countries, many European states have achieved relatively high recovery and recycling rates for C&D waste, driven by European Union policies promoting resource efficiency, waste valorisation and reduced landfill dependency. Selective demolition, material segregation at source, concrete recycling, steel recovery and the reuse of secondary aggregates are now common practices among major demolition contractors and waste management operators.

Nevertheless, Europe continues to face several operational and structural challenges, including:

- inconsistent implementation of circular economy policies between member states;
- variable quality standards for recycled construction materials;
- economic barriers affecting the competitiveness of recycled aggregates compared with virgin materials;
- difficulties associated with hazardous material removal in older buildings;

In recent years, European governments, contractors and industry associations have increasingly invested in digital material tracing, urban mining strategies and low-carbon construction methods in order to further strengthen circularity within the built environment sector.

The table below lists some examples of leading European companies in the field of sustainable construction and demolition waste management.

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TABLE 4: EUROPEAN CASE STUDIES OVERVIEW

Country	Organisation/Initiative	Main Contribution
Portugal	Grupo Mota-Engil	
Italy	GATTI Group/CDWcircle project	Full recycling of C&D waste
Spain	FERROVIAL Construction	Circular infrastructure and waste innovation
France	SUEZ Recycling and Recovery	Digital and Smart Waste Solutions
Sweden	Ragn-Sells Group	Demonstrating the compatibility of business and sustainability

8.1 Portugal – Grupo Mota-Engil [24]

Mota-Engil is a multinational Portuguese group, founded in 1946, recognised as one of Portugal's leading engineering and environmental-services groups, operating internationally across Europe, Africa, and Latin America.

The group is widely recognised for its large-scale infrastructure projects, environmental and engineering divisions, and increasing commitment to sustainability, circular economy principles, waste valorisation and responsible resource management within the construction sector.

Its international experience, particularly in African countries, provides practical knowledge of the operational, environmental, and governance challenges associated with sustainable construction and waste-management systems in emerging economies.

Mota-Engil contributes significantly to sustainable Construction and Demolition Waste (CDW) management by promoting recycling, waste recovery, environmental compliance, and sustainable construction methodologies. The company integrates environmental-management practices into infrastructure and urban-development projects, encouraging more efficient use of resources and reduction of waste generation throughout the construction lifecycle.

The aspects of greatest relevance for GROW are:

- integration of sustainable construction and circular-economy approaches;
- practical implementation of recycling and construction waste-recovery operations;
- strong operational experience in African construction and infrastructure contexts;
- promotion of innovation and low-carbon development.

8.2 Italy –Gatti Group / CDW Circle project[25]

Gruppo Gatti S.p.A. is an Italian environmental-services and recycling company specialised in waste management, recovery of secondary raw materials, environmental remediation, and circular-economy solutions. Founded in 1962, and headquartered in Brescia, Lombardy, the group has been a leading regional benchmark in the construction supply chain, with particular expertise in the treatment, recovery, and valorisation of construction and demolition waste (CDW). It employs over 180 people and manages an extensive fleet of more than 100 industrial vehicles.

One of the most relevant aspects of Gatti Group's activities is its participation in the **CDW Circle project**, an initiative focused on promoting circular economy approaches within the CDW management sector by improving the recovery, reuse, and recycling of construction materials. Through this project, the company

[24] https://www.mota-engil.com/

[25] https://gruppogattispa.it/
https://gruppogattispa.it/news/cdw-circle-construction-demolition-waste
https://webgate.ec.europa.eu/life/publicWebsite/project/LIFE22-ENV-IT-LIFE-CDW-CIRCLE-101113587/value-added-recycled-materials-from-construction-and-demolition-waste

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contributes to the development of sustainable waste-management systems, reduction of landfill dependency, and promotion of resource-efficient construction practices.

The company promotes the transformation of construction waste into reusable secondary raw materials, supporting more sustainable and low-impact construction value chains.

The company is particularly relevant for the GROW project because it demonstrates how private-sector environmental operators can combine technical innovation, waste valorisation, and sustainability governance within the construction sector.

Greatest relevance for GROW:

- practical implementation of circular-economy models in construction waste management;
- advanced recycling and recovery systems for CDW materials;
- integration of environmental sustainability and industrial innovation;
- participation in European collaborative initiatives such as CDW Circle, supporting knowledge transfer and good-practice sharing that lead to green skills development and circular economy principles adoption.

8.3 Spain – FERROVIAL Construction[26]

FERROVIAL Construction is recognised as one of Europe's leading infrastructure and construction companies, internationally recognised for integrating sustainability, circular economy principles, and environmental innovation into large-scale engineering and urban-development projects. The company operates across transport infrastructure, railways, roads, airports, and urban services, while promoting low-carbon and resource-efficient construction practices.

Ferrovial has developed advanced approaches to sustainable Construction and Demolition Waste (CDW) management through the recovery, recycling, and reuse of construction materials within its infrastructure projects. One of its most relevant initiatives involved the use of regenerated and recycled materials in railway construction, demonstrating how recovered aggregates and secondary raw materials can be reintroduced into construction value-chains while reducing environmental impact and dependence on virgin resources.

The company promotes selective demolition, recycling of asphalt and aggregates, sustainable procurement systems, and circular design methodologies aimed at reducing landfill disposal and carbon emissions.

Main aspects relevant for GROW:

- practical implementation of circular-economy approaches in infrastructure projects;
- advanced recycling and reuse systems for construction materials;
- integration of environmental sustainability, innovation and digitalisation, reinforcing the importance of modern green skills within construction-sector;
- promotion of innovation and resource efficiency within the built environment sector.

8.4 France – SUEZ Recycling and Recovery Europe[27]

SUEZ Recycling and Recovery is one of the world's leading environmental-services companies, operating advanced recycling and resource-recovery systems for municipal, industrial, and construction waste streams.

[26] https://www.ferrovial.com/en/sustainability/environment/circular-economy/waste-management/; https://www.ferrovial.com/en/business/projects/use-of-regenerated-and-recycled-materials-in-a-railway-construction/

[27] https://www.suez.com/en/waste/waste-recycling

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Within the field of Construction and Demolition Waste (CDW) management, SUEZ plays an important role through advanced recycling, sorting, and material-recovery processes that allow construction waste to be transformed into reusable secondary raw materials.

SUEZ's operational model combines technological innovation, environmental compliance, digital monitoring systems, and circular-economy strategies. The company also supports industrial symbiosis and low-carbon transitions by encouraging reuse and valorisation of materials within construction and urban-development value chains.

Relevant aspects for GROW

- Advanced recycling technologies and resource-recovery systems;
- Use of digital and environmental monitoring technologies;
- Practical implementation of circular-economy methodologies that can be adapted to work-based learning activities;
- International Sustainability Standards operationalisation

8.5 Sweden – Ragn-Sells Group[28]

Ragn-Sells Group is a Swedish environmental-services and recycling company specialising in waste treatment, resource recovery, circular-economy solutions, and sustainable materials management. Operating across Sweden, Norway, Denmark, and Estonia, the company is internationally recognised for transforming waste streams into valuable secondary resources through innovative and environmentally sustainable processes.
Ragn-Sells is a key player in the sustainable Construction and Demolition Waste (CDW) management by promoting advanced recycling systems, recovery of secondary raw materials, and circular-construction practices. The company focuses on reducing landfill dependency and maximising the reuse of construction materials through efficient sorting, processing, and material valorisation systems. Its activities contribute to the transition from traditional linear waste-disposal models towards circular and resource-efficient construction ecosystems.
The company develops solutions aimed at recovering valuable materials from waste streams while reducing carbon emissions and environmental impact. Its operational philosophy is based on the principle that waste should be viewed as a resource rather than a disposal problem, which aligns closely with modern circular economy approaches in the construction sector.

The company's main relevant aspects for GROW are:

- advanced resource-recovery and material-valorisation systems;
- innovative approaches to recycling and secondary raw-material production, reinforcing the importance of innovation within green-skills development;
- Its operational practices demonstrate economically viable circular-economy business models relevant to entrepreneurship and green job creation;
- promotion of low-carbon and resource-efficient construction practices.

9. AFRICAN BEST PRACTICES AND CASE STUDIES

Publicly documented examples of demolition contractors in Sub-Saharan Africa applying circular economy principles are still relatively limited. In many African markets, construction and demolition (C&D) waste is still predominantly landfilled or illegally dumped.

Operational challenges commonly faced across Sub-Saharan Africa, include:

- limited recycling infrastructure;
- weak enforcement mechanisms;
- informal waste-management practices;
- low public awareness regarding construction waste recovery.

[28] https://www.ragnsells.com/about-us/trading/materials/hazardous-waste/

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However, several organisations and associated recycling operators are beginning to integrate practices such as material recovery, selective demolition, concrete recycling, reclaimed steel recovery, and reuse of demolition aggregates.

Table 5 lists some good examples, which are discussed in more detail below.

TABLE 5: AFRICAN CASE STUDIES OVERVIEW

Country	Organisation / Initiative	Main Contribution
Nigeria	LAWMA Circular Waste Initiatives	Practical waste management ecosystem development
Mozambique	AMOR	Scalable waste sustainability based on raising awareness of the value of waste
Senegal	Allô Gravats	Inclusiveness in the C&D waste management sector
Rwanda	Norrsken Kigali House	Circular reuse innovation
Uganda	Stone Roofing	C&D waste prevention
South Africa	Sandop Recycling	Circular C&D waste Recycling
South Africa	Draco Group	Circular C&D waste Recovery

9.1 Nigeria - LAWMA Circular Waste Initiatives[29]

The Lagos Waste Management Authority (LAWMA), a partner in this project, plays a significant role in promoting more sustainable waste-management practices within one of Africa's largest and fastest-growing urban environments. Although LAWMA's mandate covers the broader municipal solid-waste sector, the authority has increasingly contributed to the management of construction and demolition waste (CDW) through regulatory enforcement, public-private partnerships, recycling initiatives, environmental awareness campaigns, and support for circular-economy approaches.

LAWMA demonstrates how institutional leadership and multi-stakeholder collaboration can gradually improve sustainability outcomes within the construction sector.

Methodology used by LAWMA:

LAWMA's approach combines regulatory, operational, and awareness-raising methodologies, including:

- Community-based approaches;
- Practical waste management systems;
- Integrated municipal waste-management planning;
- Public-private partnership models;
- Stakeholder engagement with waste operators and local communities;
- Environmental education and sensitisation campaigns;
- Support for recycling and material recovery initiatives;
- Monitoring and enforcement of waste-disposal practices;
- Gradual integration of circular-economy concepts into urban waste governance;
- Construction, Disaster and Demolition Waste Initiative;
- Enumeration and Integration of informal waste workers.

Relevance for the GROW project

LAWMA is highly relevant for the GROW project because it provides:

- a real operational context for construction and demolition waste management in Nigeria;
- opportunities for industry and municipal stakeholder engagement;

[29] https://cddw.lawmasmartbin.com/

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- insights into labour-market needs and green-skills gaps;
- demonstrates how municipal authorities in rapidly urbanising African cities can progressively integrate CDW management into wider environmental and circular-economy strategies;
- practical examples of circular-economy implementation in African urban environments
- Examples of governance and institutional coordination relevant to TVET development.
- The organisation's experience can support GROW in:
    - aligning training programmes with real sector challenges;
    - developing practical modules on CDW management and recycling;
    - strengthening partnerships between TVET providers, municipalities, and industry actors;
    - promoting circular-construction practices and green employment opportunities;
    - integrating environmental awareness and sustainability principles into vocational education and training.

9.2 Mozambique – AMOR[30]

Direct evidence of specialised demolition contractors in Mozambique carrying out advanced selective demolition or large-scale concrete recycling remains limited in publicly available sources.
However, the emergence of a number of initiatives has already set the tone for the transition to more sustainable practices.

AMOR - The Mozambican Recycling Association is a non-profit organisation established in 2009 by environmentalists and recycling experts with the aim of promoting the circular economy and ensuring social inclusion.
It created the Blue Coins system, a transparent and measurable system that assigns a value to the waste collected, with each Blue Coin representing 1 kg of waste collected. Although created with the aim of cleaning up the coastline, it can easily be adapted to other applications of waste management.

AMOR runs educational campaigns on the 3Rs and focuses on recycling through initiatives aimed at the school community and civil society.

- recycling construction and demolition waste,
- recovering metals and aggregates,
- and reducing landfill disposal.

9.3 Senegal – Allô Gravats[31]

Allô Gravats is a specialized waste collection and sanitation service in Dakar, Senegal, launched by the Senegalese government to manage construction and demolition waste.

Operated by the SONAGED SA, Allô Gravats collects the waste in return for a fee, paid by the businesses, communities or individuals who request rubble collection via the digital platform, and transports it to a recycling facility to be sorted and recycled. This facility crushes the gravel and residual stones and uses sand from dredging for road embankments and the manufacture of paving blocks. In this way, C&D waste is diverted from landfill, and its useful life is extended, whilst improving the condition of access roads and pavements and contributing to increased economic activity in the recycling industries.

Relevance for GROW:

- Material reuse from deconstruction
- reduces the level of illegal waste dumping
- Potential contribution to local construction value chains and employment opportunities aligned with green-skills development

[30] https://associacao-mocambicana-reciclagem.org/
https://www.3rmozambique.com/
[31] Facebook page: SONAGED SA - https://www.facebook.com/sonagedsa
Instagram: sonaged_sa

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9.4 Rwanda – Norrsken Kigali House[32]

Norrsken Kigali House is a pioneering project in Rwanda, involving the extensive reuse of materials and the existing structure. As the building dates from 1938, the structure and load-bearing walls have been retained to extend the building's lifespan. In areas where demolition was unavoidable, most of the materials were recovered—such as flooring, bricks, steel, etc.—and reintegrated into the design of the new building or used in the landscaping. The existing landscape has been retained, with the buildings designed around the trees. In turn, the principle of modularity guided the design of the new structures to allow for subsequent dismantling and reuse at the end of their service life. 100% of the roof area is covered with photovoltaic solar panels, and rainwater harvesting systems have been incorporated. The building's cooling system was also designed with sustainability in mind, replacing the need for mechanical cooling as much as possible with a passive cooling system that uses the difference in level between the existing buildings and the street.

Relevance for GROW

- material reuse from deconstruction of the old buildings
- landscape conservation - existing trees were carefully removed and replanted where needed
- space passive cooling and use of renewable energy
- opportunities for training and green job creation

9.5 Uganda – Stone Roofing[33]

Stone Roofing is a construction company specialising in durable stone roofing for houses. The roofing is lighter and more economical (by around 20%) than clay tiles; it can be easily cleaned, is more resistant to water and fire, and is self-regulating (warm in cold weather and cool on hot days). At the end of the building's life, the stones can be recovered and reused in new projects.

This project led to the creation of the International Institute for Excellence in Stone Roofing, where 200 young people were trained at various levels of the production lines, such as quarrying, transport, preparation and fittings.

The roofing technology is simple, not requiring special machinery and depends solely on the availability of suitable raw materials.

Relevance for GROW

- prevention of C&D waste
- more efficient use of resources by enabling thermal self-regulation
- green job creation

9.6 South Africa – Sandop Recycling[34]

Although primarily a recycling operator rather than a pure demolition contractor, Sandop works directly with construction and demolition waste streams and converts demolished concrete into reusable materials for construction. This is a practical example of material circularity in the demolition sector.

Relevance for GROW

- Recycles concrete and demolition rubble into reusable aggregates
- Contributes to green job creation
- Assumes that its Mission is to turn waste into value
- Advocates that recycling and reusing reduce carbon footprint and extends the life of landfills

[32] https://modelofarchitecture.org/projects/norrsken-kigali-house

[33] Facebook page: Stoneroofing Uganda Limited - https://www.facebook.com/stoneroofinguganda

[34] https://www.sandop.co.za

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9.7 South Africa – Draco Group[35]

The Draco Group is a Johannesburg-based contractor specialized in complex industrial demolition, structural rehabilitation, site remediation, and hazardous waste (asbestos) management across South Africa.
The Group states that its demolition operations include 'the recovery, resale or reuse of materials' and buy-back schemes for recovered steel. These are circular practices by retaining material value within the construction supply chain rather than disposing demolition waste materials to landfills.

Activities carried out by Draco Group:

- Concrete and building material is crushed or broken up and transported to a licensed landfill site or made into base course material.
- Scrap metal is separated, cut and transferred to a metal processing centre.
- Non-ferrous materials, such as copper and aluminium, are identified and separated into the correct categories, then transported to the foundry for recycling.
- As far as possible, striped items are sold into the second-hand market.
- The remaining debris is taken to a landfill site in accordance with the Landfill Directive.
- Documentation confirming the dates, quantities, transportation methods and destinations of each process is supplied.
- All hazardous and contaminated materials, such as asbestos, oil and bitumen, are disposed of in accordance with legislated requirements. All disposals come with certificates that guarantee materials have been disposed of correctly and legally.

Relevance for GROW

- Expertise in integrated waste-management and recycling operations relevant to sustainable Construction and Demolition Waste (CDW) systems.
- Practical experience in circular-economy and sustainable C&D waste management approach applicable to GROW's training programme.
- Operational knowledge of environmental compliance, waste logistics, and material recovery processes relevant to TVET curriculum development.
- Demonstrated collaboration with municipalities, industry actors, and environmental stakeholders, supporting GROW's multi-stakeholder and work-based learning approach

10. RECOMMENDATION FOR GROW CURRICULUM DEVELOPMENT

As a final outcome of the analysis carried out as part of this deliverable, a number of recommendations are put forward regarding the curriculum and training content of the GROW course on 'Sustainable management of C&D waste'.

10.1 Strategic Recommendations

Overall, the development of the GROW training course curriculum should ensure that it takes the following aspects into account, so that the projects' objectives are met:

1. Align all training outcomes with ESCO competencies;
2. Develop modules that are sufficiently flexible to accommodate the specific features of each country, Nigeria and Mozambique

[35] https://dracogroup.co.za
https://www.linkedin.com/company/draco-groupdemolition/

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3. Ensure strong involvement of construction industry stakeholders, namely for co-design and validation of the course modules;
4. Integrate entrepreneurship and digital skills across all modules;
5. Include practical site-based learning;
6. Develop dual-language learning resources (English and Portuguese);
7. Ensure accessibility and gender inclusion, following the GROW Gender and Social Inclusion Guidelines (deliverable D5.1);
8. Create certification pathways compatible with national TVET systems in Nigeria and Mozambique

10.2 Pedagogical Recommendations

Taking into account the best practices analysed, and the needs identified in both countries targeted by this project, the following pedagogical recommendations emerge:

1. Blended learning delivery (classroom and online);
2. Competency-based assessment;
3. Modular structure;
4. Practical simulations;
5. Work-based learning;
6. Industry apprenticeships;
7. Open educational resources;
8. Digital and entrepreneurship learning, circular economy principles, health and safety measures integration;

10.3 Recommended Curriculum Structure

This deliverable proposes a **modular structure** for the training course on '**Sustainable C&D Waste Management'**, incorporating the content identified as the cornerstones of a training programme tailored to market needs.

The curriculum structure presented takes into account a cross-analysis of all the results of the studies carried out as part of the skills gap analysis in the C&D waste management value chain, the report on training needs (D2.1) for trainers in the field of waste management, the ESCO green skills framework, best practices from leading companies in the construction sector, existing training materials, and also the primary objective of ensuring social and gender inclusion at all stages of the programme (as established in D5.1)**,** always considering the different and specific realities from Nigeria and Mozambique.

The GROW course should consider the following training modules:

10.3.1 Module on Pedagogical upskilling

According to the findings of the D2.1 Training Needs Report, it is essential to provide trainers with further training to **integrate workplace learning methodologies**, adapt to **online or blended teaching**, and ensure that the **principles of social and gender inclusion** outlined in D5.1 are incorporated into all lessons.

10.3.2 Module on Technical CDW management skills

In this module, it is important to establish a **common foundation for both countries**, whilst retaining sufficient **flexibility for contextual adaptation**. Both countries share fundamental needs in areas such as waste identification, sorting, safe handling, reuse, recycling, compliance with environmental standards and the circular economy, but are at different starting points.

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This module should cover the **fundamentals of construction and demolition waste management**, presenting methods for **identifying and classifying waste**, as well as the processes involved in its **separation**, **recycling** and **reuse**.
It is essential that it addresses **waste prevention** and **reduction techniques**, as well as **health and safety** measures for the safe handling of waste, including transport, storage and treatment.
Alternatives for **responsible disposal** and **energy recovery technologies** should also be presented in this module.
It is also essential to include **case studies** that link the content to the real-world workplace.
Given the breadth of the content covered and to facilitate understanding, the subject matter should be divided into **learning units**.

10.3.3 Module on Green Entrepreneurship in the CDW management sector

This module aims to impart knowledge that enables trainers and learners to acquire **practical skills in business development**, **budgeting** and **market analysis**, with a primary focus on the **valorisation of CDW,** the creation of **circular job opportunities** and **self-employment.**

10.3.4 Module on Digital Skills for the Green Construction Sector

This module should prepare educators and students for **tech-driven employment**, equipping them with the necessary **digital literacy**, applied to modern CDW management.

10.3.5 Module on Partnership strategies

This module would **strengthen circular waste initiatives** by addressing the importance of **networking** between private sector, local authorities and informal sector. The development of partnership strategies will be the central theme of this module and should ensure that trainers and students recognise the crucial importance of stakeholder engagement for the successful implementation of circular economy measures and business models in the C%D waste management sector.

This curriculum would provide a coherent pathway from foundational awareness through to technical competence, digital capability, entrepreneurship and workplace application, fully aligned with the needs identified in D2.1, the ESCO mapping, pedagogical recommendations, and the GROW strategic objectives.

11. ACTION PLAN FOR CONNECTING WITH ENTITIES INVOLVED IN SIMILAR ACTIVITIES

11.1 Purpose

The purpose of this Action Plan is to establish a structured framework for **identifying, engaging** and **collaborating** with **key stakeholders involved in Construction and Demolition Waste (CDW) management** in **Nigeria** and **Mozambique**, including TVET institutions, public authorities, private sector organisations, recycling operators, construction companies, industry associations and civil society organisations, in order to support the successful implementation and long-term sustainability of the GROW project.

As part of the preparation activities for the **Stakeholders' Workshops** held in **Nigeria** (on April 14, 2026) and **Mozambique** (on April 24, 2026), an initial stakeholders mapping exercise has already been conducted. The mentioned workshops enabled the collection of participating stakeholders' insights regarding the identification of skills gaps in the CDW management value chain and the assessment of

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current and future needs in both the labor market and training, which will guide the design of a demand-driven training course.

The aim of this Plan is to set out the necessary steps to not only maintain but also expand this stakeholder network and ensure the necessary engagement required to make an effective contribution to the delivery of **work-based training** and **on-the-job experiences**, in which students can apply the green skills they have learnt during the theoretical part of the training to real-world projects in the workplace, have the opportunity to undertake **study visits**, undertake **potential work placements**, or even go on to work within these organisations.

The Action Plan contributes directly to GROW's objectives of **developing market-driven green skills**, **strengthening TVET systems**, **promoting circular economy practices**, supporting **green entrepreneurship** and facilitating the **transition towards sustainable CDW management**.

11.2 Strategic Objectives

The stakeholder engagement strategy aims to:

- Establish sustainable partnerships between education providers and the CDW sector;
- Facilitate work-based learning, internships and industry placements;
- Align training programmes with labour market needs;
- Promote knowledge transfer between European and African stakeholders;
- Encourage the adoption of circular economy practices within the construction sector;
- Support future certification, accreditation and recognition of green skills;
- Create pathways for graduate employability and entrepreneurship;
- Foster public-private cooperation in sustainable waste management.

11.3 Stakeholder Mapping and Expected Contributions

The stakeholder engagement strategy is designed to achieve a wide range of objective:

TABLE 6: STAKEHOLDERS' MAPPING AND CONTRIBUTION

Stakeholders	Target Organisations	Expected Contributions
TVET and Educational Institutions	- Vocational training centres - Technical colleges. - Polytechnics. - Universities with programmes in construction, environmental management and engineering. - Teacher training institutions	○ Curriculum implementation ○ Training delivery ○ Pilot testing of learning materials ○ Participation in ToT programmes ○ Research & Innoation activities
Public Authorities and Regulatory Bodies	- Municipal waste management authorities - Ministries responsible for Education, Environment and Public Works - Construction regulatory agencies - Local government authorities - Environmental protection agencies	○ Policy alignment ○ Regulatory guidance ○ Support for certification and accreditation ○ Access to public waste management initiatives ○ Facilitation of stakeholder coordination
Private Sector and Industry	- Construction companies - Demolition contractors - Waste management operators - Recycling companies - Circular economy enterprises	○ Industry expertise ○ Work-based learning opportunities ○ Site visits ○ Guest lecturers ○ Employment pathways

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	- Construction materials manufacturers	○ Validation of occupational profiles and competencies
Civil Society and Industry Associations	- Recycling associations - Environmental NGOs - Community organisations - Green entrepreneurship networks - Chambers of commerce	○ Community engagement ○ Awareness raising ○ Inclusion of informal sector actors. ○ Dissemination of project results ○ Support for entrepreneurship development

11.4 Engagement Activities

The actions to be undertaken to engage stakeholders in order to achieve the desired outcome in terms of their contributions to the GROW objectives must follow a series of stages, each of which corresponds to the **steps in the Stakeholder Engagement Action Plan**, as detailed in Table 7:

TABLE 7: STAGES OF THE ACTION PLAN

Phase	Actions	Outcomes
Stage 1 - Stakeholder Identification and Outreach	• Develop a stakeholder database • Categorise stakeholders by sector and influence • Conduct introductory meetings. • Present GROW objectives and expected benefits	○ Stakeholder mapping report ○ Stakeholder contact database ○ Memorandum of Understanding (where appropriate)
Stage 2[36] **-** Consultation and Co-creation	• Organise national stakeholder workshops • Conduct focus groups with industry representatives • Validate competency needs and occupational profiles • Gather feedback on curriculum design (where applicable)	○ Consultation reports ○ Skills validation reports ○ Recommendations for curriculum refinement
Stage 3[37] **-** Partnership Development	• Formalise cooperation agreements • Establish industry advisory groups • Identify internship and apprenticeship opportunities. • Create mechanisms for employer participation in training delivery	○ Partnership agreements ○ Advisory Board structure ○ Work-based learning framework
Stage 4 - Implementation and Knowledge Exchange	• Organise site visits to recycling and waste management facilities • Deliver guest lectures from industry experts • Promote exchanges between African and European stakeholders • Facilitate practical demonstrations and pilot projects	○ Knowledge exchange events ○ Industry masterclasses ○ Site visit reports ○ Demonstration projects

[36] This phase directly supports the GROW methodology, which emphasises stakeholder consultation, labour market alignment and adaptation of training content to local realities.

[37] Feedback from stakeholders gathered at workshops E2.1 and E2.2 highlights partnerships with industry and work-based learning as key mechanisms for addressing skills gaps and enhancing the relevance of vocational education and training.

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Stage 5 - Sustainability and Long-Term Networking	• Establish communication channels	○ Memorandum of Understanding between TVET institutions and other CDW management related institutions

11.5 Engagement Tools

The following tools can be used to ensure consistency in stakeholder engagement:

- Periodic newsletters;
- Project website updates;
- Social media campaigns;
- Sharing information about events at which the project is presented;
- Dissemination of best practices and success stories.
-

11.6 Expected Impact

The implementation of this networking Action Plan will contribute to:

- Stronger cooperation between education and industry;
- Improved relevance of TVET programmes;
- Increased adoption of circular economy practices;
- Enhanced employability of learners;
- Greater participation of public authorities in green skills development;
- Expansion of sustainable CDW management practices;
- Creation of a long-term multi-stakeholder ecosystem supporting green transition objectives in Nigeria and Mozambique.

By building structured relationships among TVET providers, public institutions, waste management authorities, recycling organisations and construction companies, GROW will create the collaborative environment necessary to support sustainable skills development, circular economy innovation and green job creation within the construction sector.

12. CONCLUSIONS

This deliverable has provided a comprehensive analysis of European and African green skills frameworks, ESCO competencies, existing Construction and Demolition Waste (CDW) training initiatives, and relevant good practices to support the development of the GROW training programme.

The report confirms that the transition towards a circular and resource-efficient construction sector requires a new generation of vocational training programmes capable of equipping learners, trainers and sector stakeholders with the technical, digital, entrepreneurial and transversal competences needed to address current and future challenges in CDW management.

The review of European and African policy frameworks demonstrates a strong convergence around the need to modernise TVET systems, strengthen green skills development, promote circular economy principles, and create employment opportunities linked to sustainable growth. At the same time, the analysis highlights the importance of ensuring that international competency frameworks and training models are adapted to local realities. The findings from D2.1 clearly show that Nigeria and Mozambique face different starting points in relation to CDW management and green skills development. Consequently, the future GROW curriculum benefits from combining internationally recognised

competency references, particularly those provided by ESCO, with context-specific learning approaches that respond to local labour market needs, institutional capacities and regulatory environments.

The ESCO framework has been identified as a particularly valuable reference for the project because it offers a structured methodology for defining occupational profiles, learning outcomes and competency standards linked to sustainable construction, waste management, circular economy, digital innovation and green entrepreneurship. However, the analysis also confirms that ESCO should not be applied as a rigid model. Its greatest value for GROW lies in its capacity to guide curriculum design while allowing sufficient flexibility to accommodate the specific economic, social and operational realities of Mozambique and Nigeria.

The benchmarking of existing training programmes and the review of European and African case studies further demonstrate that successful CDW management depends not only on technical expertise but also on strong partnerships between education providers, industry, public authorities and civil society organisations. The examples analysed show that effective training programmes increasingly combine competency-based learning, practical experience, digital tools, entrepreneurship education and work-based learning methodologies. These elements are particularly relevant for GROW, as they directly address the skills gaps and institutional challenges identified through stakeholder consultations in both target countries.

Based on the evidence gathered, this deliverable recommends the development of a modular, blended and demand-driven curriculum focused on sustainable CDW management. The proposed training structure combines pedagogical upskilling, technical waste management competences, digital skills, green entrepreneurship and partnership-building strategies. Such an approach will not only strengthen the capacities of trainers and learners but also contribute to improved employability, support the emergence of green businesses and foster greater adoption of circular economy practices within the construction sector.

Furthermore, the stakeholder engagement action plan developed under this deliverable provides a practical roadmap for strengthening cooperation between TVET institutions, municipalities, waste management operators, construction companies, recycling organisations and policy-makers. These partnerships will be essential to ensure the relevance, sustainability and scalability of the GROW training programme beyond the lifetime of the project.

In conclusion, this deliverable establishes the strategic, pedagogical and competency-based foundations necessary for the successful development of the GROW curriculum. Together with the findings presented in D2.1, it provides a robust evidence base for designing a training programme that is relevant, inclusive, future-oriented and aligned with both international standards and local realities. By supporting the development of green skills in construction and demolition waste management, GROW has the potential to contribute significantly to environmental sustainability, circular economy development, workforce transformation and green job creation in Nigeria and Mozambique, while serving as a replicable model for TVET modernisation across Sub-Saharan Africa.

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