Greening TVET Institutions

A Guide for TVET Practitioners

Published by: Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) mbH
Greening TVET Institutions

A Guide for TVET Practitioners

How to facilitate the process of greening TVET institutions
A good practice example from South Africa
# Content

Figures ........................................................................................................................ 4
Tables .......................................................................................................................... 4
Boxes .......................................................................................................................... 4
Abbreviations ............................................................................................................... 5
Foreword ..................................................................................................................... 7

1 Greening TVET Colleges – how can Individual Human Capacity Development contribute? ........................................ 13
   1.1 The HCD Approach ....................................................................................... 13
   1.2 A Good Practice Example ............................................................................. 14
2 Role and tasks of TVET institutions in the context of a greening economy .......... 30
   2.1 Need for greening the economy ................................................................... 30
   2.2 TVET – master key for a green(ing) economy ................................................ 33
   2.3 Greening TVET institutions .......................................................................... 34
3 The Greening TVET Institutions approach .................................................................. 35
   3.1 Overview ....................................................................................................... 36
   3.2 Principles of greening TVET institutions ....................................................... 36
   3.3 Getting started: Greening TVET institutions in seven steps ........................... 37
4 Greening TVET institutions: examples and experiences from South Africa .......... 45
   4.1 Procedure .................................................................................................... 45
   4.2 Interim results ............................................................................................. 46
5 Greening TVET institutions in Germany .................................................................. 57
   5.1 Introduction .................................................................................................. 57
   5.2 Greening activities according to the five dimensions ..................................... 57
   5.3 Greening TVET institutions based on a holistic approach .............................. 63
Bibliography ............................................................................................................... 73
Photo credits .............................................................................................................. 74
Figures

Figure 1: HCD & Capacity Development Strategy: Results on all levels...............11
Figure 2: The Greening TVET Institutions concept........................................35
Figure 3: Internal and external stakeholders represented in the EMS of
Vocational College Neuss........................................................................63

Tables

Table 1: HCD contribution to the Skills for Green Jobs programme ...............15
Table 2: Greening TVET colleges in practice: involvement of stakeholders .........18
Table 3: Features of the CSCL-Course “Greening TVET institutions” ...............27

Boxes

Box 1: HCD Formats..........................................................................................11
Box 2: Reasons why the TVET colleges participated in the GTI Initiative........14
Box 3: Importance of exchange with other TVET colleges..............................16
Box 4: Renewable Energy Technologies introduced in NC(V) programme ......17
Box 5: What was expected from the participating TVET colleges? ...............22
Box 6: Preparation of the training course “Greening TVET Colleges in Practice”.23
Box 7: The contribution of TVET to a sustainable development .....................33
Box 8: Lessons learnt of South African project managers ..............................40
Box 9: Environmental policy............................................................................42
Box 10: Recommendations of South African project managers.......................45
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AIZ</td>
<td>Academy for International Cooperation</td>
</tr>
<tr>
<td>BBS</td>
<td>Berufsbildende Schule(n) [part-time and full-time vocational school(s) in Germany]</td>
</tr>
<tr>
<td>BEAT</td>
<td>Building Energy Auditor Training</td>
</tr>
<tr>
<td>bw</td>
<td>Unternehmen für Bildung [private training provider]</td>
</tr>
<tr>
<td>BIBB</td>
<td>Federal Institute for Vocational Education and Training</td>
</tr>
<tr>
<td>BMZ</td>
<td>Federal Ministry for Economic Cooperation and Development</td>
</tr>
<tr>
<td>CD</td>
<td>Capacity Development</td>
</tr>
<tr>
<td>CEDEFOP</td>
<td>European Centre for the Development of Vocational Training</td>
</tr>
<tr>
<td>CEO</td>
<td>Chief executive officer</td>
</tr>
<tr>
<td>CFL</td>
<td>Compact Fluorescent Lamp</td>
</tr>
<tr>
<td>CFO</td>
<td>Chief financial officer</td>
</tr>
<tr>
<td>CSCL</td>
<td>Computer-Supported Collaborative Learning</td>
</tr>
<tr>
<td>DEA</td>
<td>Department of Environmental Affairs</td>
</tr>
<tr>
<td>DEDEAT</td>
<td>Department of Economic Development, Environmental Affairs and Tourism, Province of the Eastern Cape</td>
</tr>
<tr>
<td>DHET</td>
<td>Department of Higher Education and Training</td>
</tr>
<tr>
<td>DST</td>
<td>Department of Science and Technology</td>
</tr>
<tr>
<td>EMC</td>
<td>Eastcape Midlands College</td>
</tr>
<tr>
<td>EMS</td>
<td>Environmental Management System</td>
</tr>
<tr>
<td>ESD</td>
<td>Education for Sustainable Development</td>
</tr>
<tr>
<td>EWSETA</td>
<td>Energy and Water Sector Education and Training Authority</td>
</tr>
<tr>
<td>FET</td>
<td>Further Education and Training</td>
</tr>
<tr>
<td>GAP</td>
<td>Global Action Programme</td>
</tr>
<tr>
<td>GIZ</td>
<td>Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH</td>
</tr>
<tr>
<td>GTI</td>
<td>Greening TVET Institutions</td>
</tr>
<tr>
<td>HCD</td>
<td>Human Capacity Development</td>
</tr>
<tr>
<td>ILO</td>
<td>International Labour Organization</td>
</tr>
<tr>
<td>ISO</td>
<td>International Organization for Standardization</td>
</tr>
<tr>
<td>JGS</td>
<td>Johannes-Gutenberg-Schule</td>
</tr>
<tr>
<td>LED</td>
<td>Light-emitting diode</td>
</tr>
<tr>
<td>merSETA</td>
<td>Manufacturing, Engineering and Related Services Sector Education and Training Authority</td>
</tr>
<tr>
<td>NBI</td>
<td>National Business Initiative</td>
</tr>
<tr>
<td>NCV</td>
<td>National Curriculum Vocational</td>
</tr>
<tr>
<td>NSDS</td>
<td>National Skills Development Strategy</td>
</tr>
<tr>
<td>OD</td>
<td>Organizational Development</td>
</tr>
<tr>
<td>OHAS</td>
<td>Occupational health and safety</td>
</tr>
<tr>
<td>PSDF</td>
<td>Provincial Skills Development Forum / Eastern Cape</td>
</tr>
<tr>
<td>PV</td>
<td>Photovoltaic</td>
</tr>
<tr>
<td>QMS</td>
<td>Quality Management System</td>
</tr>
<tr>
<td>R &amp; D</td>
<td>Research &amp; Development</td>
</tr>
<tr>
<td>RE</td>
<td>Renewable Energy / Energies</td>
</tr>
<tr>
<td>RET</td>
<td>Renewable Energy Technology Training</td>
</tr>
<tr>
<td>ROI</td>
<td>Return on investment</td>
</tr>
<tr>
<td>SDG</td>
<td>Sustainable Development Goals</td>
</tr>
<tr>
<td>SETA</td>
<td>Sector Education and Training Authority</td>
</tr>
<tr>
<td>SIGJ</td>
<td>Skills Development for Green Jobs</td>
</tr>
<tr>
<td>SWH</td>
<td>Solar Water Heating</td>
</tr>
<tr>
<td>TVET</td>
<td>Technical and Vocational Education and Training</td>
</tr>
<tr>
<td>UNEP</td>
<td>United Nation Environmental Programme</td>
</tr>
<tr>
<td>UNESCO</td>
<td>United Nations Educational, Scientific and Cultural Organization</td>
</tr>
<tr>
<td>UNEVOC</td>
<td>International Centre for Technical and Vocational Education and Training</td>
</tr>
<tr>
<td>UNIDO</td>
<td>Nations Industrial Development Organization</td>
</tr>
<tr>
<td>WCED</td>
<td>World Commission on Environment and Development</td>
</tr>
</tbody>
</table>
Foreword

Increasingly, environmental problems such as climate change, water and resource scarcity lead to economic, socio-political and ecological risks in countries across the world. But in developing and emerging countries, these problems also contribute to the spread of poverty and educational deficits. The transition to a green economy is often seen as a way out of the ecological crisis. At the same time, the shift towards a more resource-efficient economy will influence both the employment market and the education systems. What is the connection between the two?

A prosperous green economy needs skilled employees and professionals who are adequately trained and have comprehensive knowledge about their fields. Many jobs and occupations are currently undergoing significant changes (e.g. in the automotive industry) and new professions will come into being, simultaneously helping economies to protect resources and to work in a resource-efficient way. As a result, Technical and Vocational Education and Training (TVET) institutions become critical for the economic and ecological development in providing demand-oriented training and further education for the workforce of a country.

South Africa provides one example of how the efforts by the government to establish a more resource-efficient and sustainable economy are closely interlinked with employment and the general situation of the nation’s TVET institutions. South Africa has embarked on a major policy drive to invest in a green economy. The New Growth Path of 2010 indicates a potential 300,000 additional jobs by 2020 in the green economy. The fields of renewable energy and energy efficiency offer much of this potential. The New Growth Path further identifies the need for new kinds of vocational education and training related to green technologies. In this context, green skills development has been identified as a key focus area. Currently there is neither a coherent national strategy nor a policy to meet the skill needs for greening South Africa’s economy.

Besides the analysis of the current situation and of what should be done to overcome the gap mentioned above, less attention has been given to the following questions: How to develop demand-driven, sector-specific skills strategies and programmes and appropriate concepts enabling TVET institutions to become active drivers for a shift towards a green economy? What competencies are needed for entire staffs of TVET institutions to provide the required skills development activities and to create a supportive school environment?

The GIZ programme “Skills for Green Jobs (S4GJ)” was designed to support this economic transition by integrating green skills on all levels of the TVET system. Taylor-made Human Capacity Development (HCD) measures supported decision makers, TVET planners, teachers and vocational college managers in their role / task to initiate and institutionalize greening processes in their institutions. They focused on integrating aspects of climate protection in existing occupational fields and fostered network-building between selected occupational groups and companies.

The present Guide for TVET Practitioners provides practice-relevant concepts and proven methods for greening TVET institutions. Based on experiences in South Africa, the manual reflects on challenges and best practices of greening processes imitated and established by TVET staff in their institutions. It demonstrates how to develop special green profiles and suggests ways of integrating all internal stakeholders. The last chapter gives an overview of similar initiatives by TVET institutions in Germany. Additionally, the practice-oriented concept of greening TVET institutions

The shift towards a green economy will influence both the employment and education.

A prosperous green economy needs skilled employees and professionals.

New jobs can be expected in the green economy if the skills gap can be bridged.

TVET institutions could become an active driver for the shift to a green economy.

GIZ programme supports economic transition by integrating green skills on all levels of the TVET system.

Guide provides practice-relevant concepts and proven methods for greening TVET institutions.
and its various training and dialogue formats might also serve as scaling-up model for other GiZ projects to ensure sustainability and a more widespread effect.

Martina Müller-Norouzi
Senior Project Manager
HCD for Technical and Vocational Education and Training
Introduction

The importance of Human Capacity Development (HCD) for sustainable development through technical and vocational education and training (TVET) is undisputed. Basically, TVET for Sustainable Development\(^1\) is required to provide the following issues:\(^2\)

- Enabling a transition to greener economies and societies by equipping learners with skills for green jobs and motivating people to adopt sustainable lifestyles.
- Empowering people to be global citizens who engage and assume active roles, both locally and globally, to face and to resolve global challenges and ultimately to become proactive contributors to creating a more just, peaceful, tolerant, inclusive, secure and sustainable world.

In order to fulfil these requirements, integrating sustainability into the skills development sector cannot be reduced to individual vocational subjects or occupations. The challenge for TVET, then, is to re-orient and re-direct its curricula with respect to (1) the conservation and sustainable use of resources, (2) social equity and appropriate development and (3) competencies to implement sustainable practices at the workplaces.

TVET institutions are of vital importance enabling the workforce to be able to meet the skills requirements of greening economies and societies. TVET for Sustainable Development or green TVET is about much more than teaching on sustainable development; it is also about practicing sustainable development and turning it into the core business of TVET institutions. Thus, a transformation of TVET institutions towards greening in a comprehensive manner requires a holistic framework.

Greening TVET institutions is on top of the international agenda. It is one of five priority action areas in UNESCO’s Global Action Programme (GAP) on ESD which will guide the follow-up to the Decade on ESD (2005 – 2014).\(^3\) Transforming learning and training environments (priority action area 2) – so it is called - does not only concern managing physical facilities more sustainably, but also changing the ethos and governance structure of the whole institution. However, the GTI approach is not isolated in this single priority area of UNESCO’s GAP, but linked with all the others:\(^4\)

- In order to foster educational change and to facilitate learning for sustainable development there is an urgent need to build the capacity of educators, as well as trainers and other change agents, on relevant issues related to sustainable development and appropriate teaching and learning methodologies. (Priority action area 3: Building capacities of educators and trainers)
- Youth is one of the focal groups of TVET. Young people shall be trained to be capable not only to make a living by applying vocational and social skills but also considering and applying these skills in order to take on producer as well as consumer responsibility for a more sustainable future. (Priority action area 4: Empowering and mobilizing youth)
- Effective and innovative solutions to sustainable development challenges are frequently developed at the local level. In order to develop measures and mechanisms to resolve the sustainable challenges facing their communities, multi-stakeholder dialogues and cooperation play a key role, e.g., between local governments, non-governmental organizations, the private sector, media, schools,

---

1 In this guide the terms TVET for sustainable development and green TVET are used synonymously.
2 This finds expression in including education - incl. TVET - as an explicit target in the proposal for Sustainable Development Goals (SDG) which will take the place of the Millennium Development Goals on the post-2015 development agenda.
3 See UNESCO 2014.
4 See ibid.
TVET and research institutions as well as individual citizens. (Priority action area 5: Accelerating sustainable solutions at local level)

- Fundamentally, sustainable development is not only an issue of individuals, but of societies. Therefore profound solutions can only be found on system level. Consequently, policy support is vital, if greening shall cover the whole TVET system and not only individual institutions. (Priority action area 1: Advancing policy)

In Germany, the discourse on greening TVET institutions started in the early 1990s. Since then, several concepts have been developed and implemented in vocational colleges and private training centres.\(^5\) Also on international level, concepts, such as eco-schools and green campus, are available. For the Greening TVET Institutions (GTI) approach introduced in this guide a concept issued by Mr Shyamal Majumdar was used as reference.\(^6\) Its five pillars (green campus, curriculum, research, community and culture) were extended i) by a profound TVET performance and ii) by the embedment of green issues in the organisation’s management system. This was done in order to underline that a green transformation process is to be seen as an integrated approach and not as an add-on on top of all the businesses expected from TVET institutions by the various stakeholders.

It is not that important which concept is used for implementing a greening process in TVET institutions as far as it covers the following vision:

Green TVET institutions

- take on responsibility for a sustainable future;
- act as role models for eco-friendliness and see themselves as an innovative and profound training provider and accepted strategic partner for a sustainable development of their region;
- have developed a special organizational profile and integrate green issues into their education and training programmes;
- promote the commitment and the competences of their staff and involve their internal stakeholders in the development of the organisation;
- are an exemplary space for living and learning;
- promote green skills;
- use the entire institution as well as the individual education and training programmes as fields for learning, research and experimentation;
- include greening issues in their management system and check and improve their performance continually.

Embedding the GTI approach in a HCD concept is much more than just introducing and implementing a new concept in an institution. It is a holistic approach that covers all intervention levels and various HCD formats. With this publication, the concept is now available for everybody interested in applying the GTI approach in international cooperation.

Dr. Klaus-Dieter Mertineit
Institute for Sustainable TVET & Management Service

---

\(^5\) Some of these have been developed by the author using the Eco-Management and Audit Scheme (EMAS) and later the Excellence Model of the European Foundation for Quality Management (EFQM) as reference models; see Mertineit 2002, Mertineit 2006 and Mertineit/Hilgers 2005.

\(^6\) See Majumdar 2010 and 2011. Prof. Dr. Shyamal Majumdar is the Director of the UNESCO-UNEVOC International Centre for Technical and Vocational Education and Training with headquarter in Bonn, Germany.
1 Greening TVET Colleges – how can Individual Human Capacity Development contribute?

1.1 The HCD Approach

GIZ’s overall capacity development approach targets three levels: individuals, organisations and systems. Interventions of Human Capacity Development (HCD) begin at the individual level. They aim at strengthening personal, social and professional competencies of key players contributing to change processes in their work environment. It has a direct impact on the individual’s social and working environment and, over the long term, on the system level. As such, it is functionally interwoven with organisational and system development.

With its specific training and dialogue measures, HCD supports the development of personal and social skills (self-management, knowledge management, networking, attitudes and roles, language proficiency and intercultural skills), technical expertise (sectoral and technical skills with practical application), managerial and methodological capacities (shaping change processes, organisational development capacities, quality management and multiplier skills) and leadership skills (innovation management, systemic thinking, leadership in complex change processes and strategy development).

Aims and activities on three levels: individuals, organisations and society.

HCD supports the development of personal and social skills as well as technical expertise, managerial and methodological capacities and leadership skills.

Box 1: HCD Formats

Depending on the intended competence development aims, different HCD formats are used, such as:

- **study trips** for raising awareness and gaining an overview of specific technical issues, particularly for decision-makers;
- **trainings (short and long term)** for qualification in specific subject areas, with a special focus on individual transfer projects and practical application in companies or institutions;
- **online learning formats** to establish learning and communication platforms, such as Global Campus 21, for the networking of educational institutions and for the realisation of high quality e-learning formats;
- **network building and dialogue events**, such as conferences or workshops, to support professional exchanges, strategy developments, policy consultation and the shaping of interdisciplinary as well as local, regional and national issues.

In order to ensure a sustainable competence development, HCD activities are always conducted as a process that is accompanied by GIZ on the following principles:

- **Holistic approach**: The impact of stand-alone methodological or technical trainings tends to be very limited since they are lacking systematic coaching and assistance to implement acquired theoretical knowledge into practice. Therefore, as already mentioned above, HCD strives at sequences of interventions and their impact on different levels of intervention.
Networking: Individuals can unfold their scope for action only on the precondition that they are adequately integrated in supportive networks. Thus, HCD supports exchange and cooperation on both horizontal and vertical levels.

Transfer: Sustainable competence development requires the transferring of newly acquired knowledge and competences in the own work environment. HCD facilitates the process of transfer with corresponding implementation-oriented follow-up activities.

### 1.2 A Good Practice Example

**Overview: HCD-activities related to Skills Development for Green Jobs and the Greening TVET Institutions Initiative in South Africa**

Within the SfGJ programme design, the described HCD approach focused on three fields of intervention that are closely interlinked with each other:

- **Dialogue and awareness raising activities** for representatives of the ministries (esp. DHET, DST, DEA), SETAs and senior management of TVET colleges, in order to systemically foster the Greening TVET Institutions process;
- **Greening TVET Institutions (GTI) Initiative** to capacitate management staff of TVET colleges to identify, implement, manage and evaluate environment projects within their institutions;
- **Renewable Energy Technology Training** to capacitate TVET lecturers to develop and implement renewable energy training modules at TVET colleges.

Originally, the activities were regionally focused on the Eastern Cape Province. In cooperation with the Office of the Premier of the Eastern Cape, with GIZ and Department of Economic Development, Environmental Affairs and Tourism, Province of the Eastern Cape (DEDEAT) a Provincial Green Skills Committee was to be established with representatives from both the industry sector and the skills development sector. During the programme, the responsibility for the TVET colleges changed from province level to national level. Considering this, the initiative was raised on national level with the DHET as the relevant counterpart for all activities in the field of green skills development.

**Dialogue and awareness raising activities**

Subsequent to the National Skills Development Strategy (NSDS) Conference in October 2011, senior management representatives of the Department of Higher Education and Training (DHET), Department of Environmental Affairs (DEA), Sector Education and Training Authorities (SETAs), Provincial Skills Development Forum / Eastern Cape (PSDF), TVET colleges, private training providers and National Business Initiative (NBI) took part in a study tour on the impact of TVET for green skills development. On the basis of German experiences in promoting green skills in the TVET system and for the labour market, the participants experienced established green economy sectors and discussed ways for creating green jobs in South Africa.

---

7 In the beginning of the programme the colleges were called "FET" colleges, later the term was changed in "TVET" colleges. In this report the term "TVET" colleges is used constantly.
In 2012, the study tour “Renewable energy and Germany’s green economy sector” provided a solid basis for executive staff to make decisions concerning green skills development, and for training staff to discuss ways to promote green skills in South Africa’s TVET system. In order to exchange ideas and experiences, stakeholders involved in the South African greening TVET process presented their approach both within the “Eastern Cape Renewable Energy Conference in partnership with the European Union” and the “World Skills Conference” held in Leipzig, Germany.

The “Greening FET Colleges Conference” in November 2013 was joined by all stakeholder levels: TVET college lecturers, TVET college change managers and representatives of DHET, merSETA and EWSETA reflected on interim results and worked out recommendations to continue, disseminate and consolidate the ongoing processes.

Shortly afterwards, representatives of DHET and SETAs took part in a study tour on “Labour market-oriented skills planning and research mechanisms in the sector of renewable energies and energy efficiency”. It was implemented in Germany and allowed the participants to identify relevant transferable components of the German TVET system focusing on systematic vocational education planning and research. The study tour “Fostering Greening FET Colleges in practice”, again, was attended by representatives of different branches of the DHET and aimed at the development of a strategy to continue, consolidate and disseminate the GTI Initiative in South Africa.

In May 2014, the conference “Greening TVET Colleges: Results and Perspectives” in Pretoria brought together all stakeholders involved in the Greening TVET Colleges process as well as participants of all HCD activities mentioned above. Special focus was set on how to continue, disseminate and consolidate the GTI, in order to agree on a respective and sustainable implementation strategy.

Greening TVET Institutions Initiative

The GTI Initiative aimed at capacitating management staff of TVET colleges to identify, implement, manage and evaluate environment projects within their institutions. The initiative was first introduced to four TVET colleges (namely Buffalo City College, Eastcape Midlands College, Ikhala College and Port Elizabeth College) by the end of 2012. Due to the change of responsibility for the TVET sector from province to national level the GTI Initiative was opened for interested vocational colleges from other provinces as well.

After running two kick-off workshops in Johannesburg and Port Elizabeth in May as well as holding consultation meetings in five TVET colleges interested in participating in the GTI Initiative, a training course in Germany was conducted in June 2013. During the course, TVET college representatives – mainly change managers – got an overview about meaning and good practice examples of greening TVET and greening vocational colleges. They developed strategies and projects to implement greening activities in their institutions, including (internet-based) cross-college communication and co-operation measures.8 In November 2013, subsequent to the “Greening FET Colleges Conference” in Pretoria, representatives of further TVET colleges took part in a GTI Initiative introductory training course and developed corresponding greening transfer activities.

To foster exchange apart from face-to-face meetings, a Shared Work Space on “Greening Colleges – Skills Development for a Green Economy” was established on

8 For further information and good practice examples see chapter 4.
Global Campus 21, GIZ’s interactive and learning platform. Its structure allows virtual
discussions and the exchange of relevant documents and information.

A Computer-Supported Collaborative Learning (CSCL) course, initiated in May 2014,
allows further TVET colleges, which are interested in the GTI Initiative, to become
acquainted with the approach and exchange ideas and experiences with involved
colleges.

Box 2: Reasons why the TVET colleges participated in the GTI Initiative

- “Boland College is participating in the Greening Colleges Initiative because the college
  seeks to develop an ethos of environmental responsibility in all its staff and students
  as well as in the management of its assets.” (Mr Kabeti Mpopote, Boland College)
- “At Central Johannesburg College the concept was initiated by the college principal
  between 2007 and 2008 when the country was experiencing the shortage of electricity,
  based on the Government call to save and conserve electricity. The principal outlined
  his vision for greening the college, and he expected all members to cascade it to
  respective campuses and sites. He also edged each campus and site to organise a
  stakeholder grouping or committee that will take the initiative further.” (Ms Gloria
  Tshabalala, Central Johannesburg College)
- “At Eastcape Midlands College we want to minimize our carbon footprint and reduce
  overhead cost with the introduction of solar and wind energy.” (Mr Ziyaad Smith,
  Eastcape Midlands College)
- “Green building on campuses is purposeful construction that decreases resource
  usage for the future. Northern Cape Rural TVET College we see the short and long
  term economic benefits. Students at campuses where greening initiatives are being
  used will benefit by increasing their potential to gain knowledge. This will afford
  the opportunity to see the campus as environmentally sustainable. Also this will make
  students aware of the issues the earth faces with carbon emissions and increased
  consumption.” (Ms Raquel Marinus, Northern Cape Rural TVET College)
- “The entire college management agreed that we, the Northlink College, as a collective
  commenced with projects that would enhance the longevity of our planet by waste
  management initiatives; energy savings programmes; resource management, etc to
  address all of the pillars on which this initiative is based. Everyone seemed very eager
  to get this off the ground and the Belhar Campus has been earmarked to spearhead
  the whole process.” (Mr Terence Slade, Northlink College)
- “Umfotlozi College is situated in the heart of the community in KwaZulu Natal which
  forms part of a wetland. We would like to teach students about the importance of
  energy conversation and about wise use of natural resources. Our intention is for
  students to take this message of conserving natural resources back into the
  community.” (Ms Sheritha Singh, Umfolozi College)

Renewable Energy Technology Training

The Renewable Energy Technology Training (RET) programme, executed between
May 2013 and April 2014, responded to the challenges of a green economy by
supporting qualified lecturers in their continuous professional development and
consequently increasing the knowledge and skills of students in respect to future
technologies.

16 TVET college lecturers of six provinces participated in the modularised training
programme. Module 1 – “Solar Technologies in Practice” – took place at Hessische
Landesstelle für Technologiefortbildung in Groß-Gerau, Germany. It focused on an
introduction to various areas of renewable energies (RE), esp. photovoltaic (PV) and
domestic solar water heating (SWH) systems, as well as vocational pedagogic and
the development of learning and teaching material. Furthermore, the participants had
the opportunity to visit the Intersolar Europe trade show and exhibition. Module 2,
conducted in Port Elizabeth College, was dedicated to the use of PV and SWH training systems as well as their implementation in and contribution to action-oriented RE classes at TVET colleges. Module 3, executed in Port Elizabeth College as well, addressed the installation of PV and SWH systems, considering aspects like commissioning, maintenance and performance validation. Module 4, finally, took place in Central Johannesburg College and focused on manual and software-based planning and design of PV systems and their subsequent mechanical and electrical installation.

Furthermore, the involved TVET colleges were provided with RE training systems and teaching materials to facilitate a sustainable and action-oriented implementation of the acquired skills in class.

Table 1: HCD contribution to the Skills for Green Jobs programme

<table>
<thead>
<tr>
<th>Results</th>
<th>Overall 72 persons were reached by the different HCD events, representing 15 TVET colleges.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The concept of “Greening TVET Institutions – TVET for a Green Economy” was introduced and disseminated in 12 colleges in South Africa. In May 2013 the GTI Initiative started with six TVET colleges and after one year representatives from 12 TVET colleges participated in the final conference. This is a doubling within one year.</td>
</tr>
</tbody>
</table>

**Results**

The HCD approach was realized in all relevant fields of intervention. All participant groups involved developed “greening” action competences to be used in their work environment. The acquired sectorial and technical skills as well as managerial and planning competences enable the involved TVET college lecturers, TVET college managers and stakeholders from governmental bodies and SETAs to establish a change of mind set and foster the ongoing process of greening TVET colleges. In order to achieve a successful and sustainable implementation of the greening process, it is crucial for the three stakeholder levels to work together cooperatively and comprehensively and use their acquired competencies in an aligned way. This interlinked approach is crucial for green skills to be thoroughly integrated in existing vocational fields. Consequently, future workforce will be capacitated to meet the labour market demand of the South African green economy.

**Results in detail:**

- Overall 72 persons were reached by the different HCD events, representing 15 TVET colleges.
- The concept of “Greening TVET Institutions – TVET for a Green Economy” was introduced and disseminated in 12 colleges in South Africa. In May 2013 the GTI Initiative started with six TVET colleges and after one year representatives from 12 TVET colleges participated in the final conference. This is a doubling within one year.
• Senior managers, management, administration and teaching staff of the participating TVET colleges as well as their students got sensitised for energy and resource protection. They introduced energy and resource protection in TVET, and thus actively supported the national sustainability strategy.

• Interestingly, the GTI approach was integrated into management structures in most colleges. In five of the seven colleges green teams or committees had been installed representing different stakeholder groups. One college already started implementing an environmental management system according to ISO 14.001 and two others were intending to do so as well. That seems to be an appropriate indicator for a long-term impact. On the other hand, at least in two colleges senior management was not properly involved in the greening process. That could be a risk for a long-term implementation if the members of the greening team will not be able to convince their senior managers to support the initiative. Interestingly, all colleges in which the contractor introduced the GTI approach to principals or vice-principals in the preparation phase do not have the problem of missing support, low acceptance and/or problems in regard to integrating green issues in management structures systematically. As a result, an agreement with top management in this issue before the process starts is an import factor of success.

Box 3: Importance of exchange with other TVET colleges

The exchange with other TVET colleges participating in the GTI Initiative has shown to be very important. Exchange of ideas and experiences as well as spontaneous feedback and recommendations from colleagues – that means: learning from each other – is an important factor not only for individual learning, but also for learning of the all colleges involved and the whole GC community.

• “Communication and cooperation with others was very important, simply because it helped me to learn from other TVET Colleges in South Africa and an opportunity to share best practices with one another.” (Mr Kapedi Mpopote, Boland College)

• “Exchange with other TVET colleges was brilliant and helpful; it gave us a wide range of spectrum in greening initiatives. Some colleges did a lot and that has built confidence in us. We have learnt some lessons different approaches and experience. We were impressed by the PE and Boland College with their LED lights being installed by students. We are trying to follow up on their examples.” (Ms Gloria Tshabalala, Central Johannesburg College)

• “It was highly beneficial to see what other campuses had been doing in regard to the greening of TVET colleges. It has allowed us the opportunity to implement ideas which we have not thought about at our campus as well. It has also allowed us to measure effectiveness of ideas with low risk of trial and error, i.e. if a system had been implemented at a college and it was not successful we could stay away from the same and not risk spending time and resources. Instead, we focused on implementing ideas that were popular and successful.” (Mr Ziyaad Smith, Eastcape Midlands College)

• “No campus sites are the same, so it is quite interesting to see how complicated and challenging change is. It is important to form work groups composed of people from different parts of the institution to address strategy issues.” (Mr Terence Slade, Northlink College)

• “The sharing of best practice surely beats reinventing the wheel to find that you have duplicated what someone else had already discovered to be working. The exchanging of ideas also inspires all stakeholders to achieve the best results and to work more eagerly at making a success of the greening process.” (Ms Raquel Marinus, Northern Cape Rural TVET College)

• “It was also good at the workshop in November 2013 to hear what everyone had done so far.” (Ms Sonja Spies, Port Elizabeth College)

• “The exchange with other colleges participating in the initiative was very important and extremely helpful.” (Ms Sheritha Singh, Umfolozi College)

• The process managers, trained in the GTI Initiative, together with their multi-disciplinary working committees / teams continued with their efforts to drive the
green agenda at colleges. Some took this even to community level, engaging their communities in greening activities, awareness campaigns and greening activism often using competitions linked to community as well as labour market needs. In addition, a few colleges entered into partnerships with critical stakeholders in the private sector, with key SETAs as well as with community stakeholders. Another few colleges embarked on new research initiatives and collaborated with other colleges as well as with universities of technology. All in all, a new quality of communication and cooperation between internal and external stakeholders could be observed.¹⁰

- Representatives of the different stakeholders in the participating TVET colleges were capacitated so that they were able to plan, implement and monitor environmental projects autonomously. Above 16 representatives of 9 TVET colleges were trained in order to introduce and implement the greening TVET institutions approach in their colleges. Until the end of the programme in May 2014 mostly all of them¹¹ implemented ambitious greening projects.

- The DHET took ownership for the GTI Initiative and nominated a Deputy Director to be responsible for the initiative. The DEA expressed its willingness to support the initiative. Both departments expressed their intention to disseminate the GTI Initiative and involve all South African TVET colleges in the long term.

- The basics for the creation of a network of greening TVET colleges are established. However it is now on the policy level (as DHET, DEA) to further promote, coordinate and extend this network.

- At the end of the programme the participating TVET colleges were in a position to continue with the GTI approach and to disseminate the concept to other colleges. The CSCL course as well as this guide for practitioners is a suitable tool to support this dissemination process.

- Being a crucial part of the RE programme, renewable energy technologies were integrated into the technical NC(V) programme as a new optional subject (see box 4).

- TVET lecturers have been trained to teach the new subject “Renewable Energy Technologies” in a practical and progressive manner. Further, appropriate training material such as student textbooks and a lecture guide have been developed for this new subject and new didactical training equipment is available too. Thus, in 2015 seven TVET colleges, including Boland, Eastcape Midlands, Ingwe, Northlink, Port Elizabeth, Umfolozi and West Coast TVET College have started to offer the new subject to around 450 students.

**Box 4: Renewable Energy Technologies introduced in NC(V) programme**

With support of the S4GJ programme, the DHET was pleased to introduce a new optional subject Renewable Energy Technologies (RET) in their technical NC(V) programme. The new subject is the latest vocational specialisation option offered in TVET colleges and has been developed for students who want to learn more about renewable energy technology. Outlined in South Africa’s new growth path (Accord 4) government commits to the procurement of renewable energy aiming to expand and diversify the nation’s energy generation capacity and to lower at the same time greenhouse gas emissions in order to meet the challenges posed by climate change. To fully realize these commitments the economy needs informed and trained human resources in this field, which continues to be a significant driver for future employment. The Industrial Development Corporation (IDC) and the South African Development Bank (SADB) estimated in 2011 that the total employment potential in the category energy generation, and energy and resource efficiency would be 130 000 and 68 000 new jobs respectively.

---

⁹ See Godden 2014. Northern Cape Rural College and Lovedale TVET College were not able to implement green issues until May 2014.

¹⁰ See table 2 which shows that a wide range of different actors have been involved in the greening processes at the TVET colleges.

¹¹ Three of them changed position in their colleges and are no longer involved in greening.
Table 2: Greening TVET colleges in practice: involvement of stakeholders

<table>
<thead>
<tr>
<th>TVET colleges</th>
<th>Stakeholders</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boland College</td>
<td></td>
</tr>
<tr>
<td>Central Johannesburg College</td>
<td></td>
</tr>
<tr>
<td>Eastcape Midlands College</td>
<td></td>
</tr>
<tr>
<td>Goldfields FET College</td>
<td></td>
</tr>
<tr>
<td>Normhik College</td>
<td></td>
</tr>
<tr>
<td>Port Elizabeth College</td>
<td></td>
</tr>
<tr>
<td>Umfolozi College</td>
<td></td>
</tr>
</tbody>
</table>

Challenges to be faced:
- budgetary constraints limited implementation;
- not all TVET colleges succeeded in ensuring the buy-in and support of strategic managers and other staff within colleges;
- not all RE lecturers were able to implement their new skills into training courses; this was due to the fact that renewable energy technologies were until then not introduced in the NCV curricula; but this changed in the meantime (see box 4).

GTI Initiative implemented into the operational plans of all public TVET colleges in the 9 provinces of South Africa

Until April 2015 the GTI has been rolled out in 5 provinces and the dates for the remaining 4 provinces are currently being finalised.

HCD interventions show a great potential to be sustainable.

At the end of the programme, some challenges had to be faced linked to the following issues:
- budgetary constraints limited implementation;
- not all TVET colleges succeeded in ensuring the buy-in and support of strategic managers and other staff within colleges;
- not all RE lecturers were able to implement their new skills into training courses; this was due to the fact that renewable energy technologies were until then not introduced in the NCV curricula; but this changed in the meantime (see box 4).

After the official programme had ended, the original intentions of GTI Initiative could be realized: the Greening TVET Institutions Initiative was implemented into the operational plans of all public TVET colleges in the 9 provinces of South Africa. This implies that each of the 50 public TVET colleges will implement and report on greening activities on an annual basis. The initiative has been jointly developed by the DHET together with the Department of Environmental Affairs (DEA). Senior college management, campus and maintenance managers as well as student representatives and support staff representatives participated in preparation workshops.

To date (April 2015) the GTI has been rolled out in 5 provinces and the dates for the remaining 4 provinces are currently being finalised. At each workshop presentations were given by DEA focusing on the relevance of the green economy for TVET colleges and by DHET on using the Greening of Colleges Guide as well as a TVET college representative of the initial Greening TVET Institutions project (2013/2014). The latter focus on experiences gained during HCD measures and training received, while already implemented greening activities in their respective colleges were presented and evaluated to the wider college environment.

Thus, at this point in time, the DHET expects that the above mentioned HCD interventions, i.e. the Greening College Initiative and the RET subject implementation (curriculum development, textbooks, teacher training etc.) show a great potential to be sustainable.
HCD activities in detail

Dialogue and awareness raising activities

New challenges in vocational education and training – A study tour on the impact of VET for green skills development

After contributing to the National Skills Conference on 4-5 October, 2011, by means of a lecture “International perspectives on skills development and the green economy” a study tour “New challenges in vocational education and training – A study tour on the impact of VET for green skills development” was executed from 7 - 15 October 2011 in Hannover and other venues in Germany. By means of expert’s presentations, field visits and discussions the 12 participants - representatives of the DHET, TVET colleges, a SETA, NBI and other relevant institutions - gained knowledge and experience necessary to start the required implementation process in their institutions in South Africa.

Programme

- Welcome, presentation of participants / expectations of the study tour, introduction to the programme
- Current situation in South Africa in respect to greening the economy and green skills development
- Skills development for a green economy in Germany
- The German dual TVET system and the relevance of energy efficiency
- Promotion of renewable energies and energy efficiency
- Production of wind energy and integration of green skills in VET
- Field visit to Vocational and Technician College Butzbach: Sustainability in TVET centres and learning organisations
- Field visit to Willer Company GmbH: Renewable energies as motor for small and medium-sized companies
- Development of transfer projects
- Final Evaluation
- Extra field visits to Hessische Landesstelle für Technologiefortbildung: International vocational training in the field of electrics / electronics, renewable energy and energy efficiency; and Career Information Centre (BIZ) Mannheim: Information on occupations with special regard to renewable energies for school leavers

Study tour “Renewable energy and Germany’s green economy sector”

The study tour “Renewable energy and Germany’s green economy sector” was held from 21 October to 3 November 2012 in Hannover and other venues in Germany. In various expert’s presentations, field visits and discussions the 14 participants – representatives of DHET; DEDEAT; Department of Roads and Public Works, Office of the Premier (Eastern Cape), EWSETA and several TVET colleges - gained knowledge and experience to give recommendations to implement green skills in their institutions in South Africa in terms of teachers’ / instructors’ training requirements, equipment needed, approaches to integrate issues of re-

The participants got informed about the role of TVET for a greening economy in Germany.

The participants outlined challenges and perspectives of the current situation in South Africa.
newable energy and energy efficiency in already existing courses resp. development of new courses, and other organisational requirements. During the study tour the participants outlined the challenges and perspectives of the current situation in South Africa in the field of renewable energies and energy efficiency, green jobs and green skills and regarding practical training in their institutions. They showed interest in cooperating with German vocational colleges and in greening their own TVET colleges in South Africa. The concept of Greening TVET institutions, presented and discussed in Butzbach, seemed to be an appropriate and suitable approach.

**Programme**

- Welcome, presentation of participants / expectations of the study tour, introduction to the programme
- Challenges and perspectives of the current situation in South Africa in respect to greening the economy and green skills development
- The German renewable energy strategy and its relevance for TVET / Skills development for a green economy
- Introduction to the dual TVET system in Germany
- Field visit to Volkswagen Commercial Vehicles: energy efficiency in the company & dual training at Volkswagen Coaching
- Field visit to Vocational College 3, Hannover: TVET for renewable energies in a vocational college
- Field visit to TVET Centre of Chamber of Skilled Crafts Hannover: TVET for renewable energies in an inter-company TVET centre
- Field visit to Edwin Academy, Bremen: trainings and jobs in wind turbine technology
- Introduction to additional qualification “International Energy efficiency”
- Role of Federal Ministry of Education in the dual TVET system
- Role of Chamber of Industry and Commerce in the dual TVET system
- Role of trade unions in the dual TVET system
- Field visit to Berufskolleg Neuss Weingartstraße: Quality and Environmental Management System in a vocational college
- Field visit to Federal Institute for Vocational Education and Training (BIBB): Role of the BIBB in the German TVET system
- Field visit to Vocational and Technician College Butzbach: Green technologies and trainings in the Vocational and Technician College Butzbach
- Greening colleges: concept, fields of action and staring points
- Expert discussion “Are the TVET systems in South Africa and Germany suitable enough to respond adequately to the rapidly changing qualification demands of the renewable energy sector?”
- Introduction to Global Campus 21, the GIZ knowledge portal for international advanced training and cooperation
- Development of transfer projects
- Final evaluation

**Study tour “Labour market-oriented skills planning and research mechanism in the sector of renewable energies and energy efficiency”**

The study tour “Labour market-oriented skills planning and research mechanism in the sector of renewable energies and energy efficiency” was organized for representatives of DHET and SETAs. It was executed from 17 to 28 November 2013 in various venues in Germany and allowed the 9 participants to identify relevant transferable components of the German TVET system focusing on systemic TVET planning and research in special regard to renewable energies and energy efficiency. In the programme, field visits to relevant institutions were combined with seminar components and work-shops. In numerous discussions, individual views were debated and conclusions drawn which formed the basis for the development and definition of a common guideline for further procedures in South Africa. Apart from...
the acquisition of new knowledge and the reflection on the possibility of an application in South Africa, the participants underlined in particular the significance of the study tour for the development of a mutual understanding and a team spirit as one of the most important success factors for their future work in South Africa.

Programme
- Official welcome / presentation of participants / expectations of the training course / introduction to the programme
- The German dual training system
- Visit to Institute for Employment Research, Nuremberg
- Visit to SKF GmbH, Schweinfurt
- Visit to Vocational and Technician College Butzbach
- Transferability of elements of the German dual training system
- Visit to the Federal Institute for Vocational Education and Training (BIBB)
- Green skills development for a greening economy
- Visit to Centre for Job Information, Cologne
- Generating new jobs in renewable energies in Germany
- Visit to Technical University Darmstadt, Department of Technical Training and Learning
- Strategies for counselling and coaching of political decision makers on ‘Skills planning and research’
- Evaluation

Study tour “Fostering Greening FET Colleges in practice”

At the end of 2013 the situation was as the following: 12 TVET colleges participated in the Greening Colleges Initiative. For lecturers a training programme on renewable energies was running. Project managers of 9 TVET colleges had been trained in regard to the Greening TVET Institutions approach and were implementing their concepts in the fields of energy and resource efficiency, renewable energy and waste management. The presentations at the Conference on “Greening TVET Colleges: Approach, Results and Perspectives”, held in Johannesburg on 8 November 2013, had shown impressively, how motivated and committed these lecturers and project managers were and that they already had achieved good results. Despite of this success story it was not clear which South African stakeholder would take on the ownership on this initiative, how it could be fostered, consolidated and disseminated and what assistance would be needed in order to enable the responsible institution / person to lead and coordinate the initiative in the future. This was the background of the study tour “Fostering Greening TVET Colleges in Practice” which was executed from 23 to 30 November 2013 in Mannheim and other venues in Germany. Seven representatives of different branches of the DHET received first hand experiences on greening TVET colleges and respective support mechanism in Germany. They reflected the GTI approach and developed a strategy and ideas how the GTI Initiative could be continued, consolidated and disseminated in South Africa.

The participants expressed that DHET has to take on ownership for the GCI. They sketched a dissemination / communication strategy and recommended involving other institutions in the process of rolling the initiative. Last but not least, the group agreed in a recommendation given in the conference on “Greening FET Colleges: Approach, Results and Perspectives“ (8 November 2013) and pointed out that there was a demand for a beginner’s manual on “Greening TVET Institutions”.

Participants reflected the GTI approach and developed a strategy and ideas how the GTI Initiative could be continued, consolidated and disseminated in South Africa.
### Programme
- Official welcome / presentation of participants / expectations of the training course / introduction to the programme
- Introduction to the Greening Colleges Initiative
- Introduction to the Greening TVET institutions approach
- Greening TVET institutions approach in the view of UNESCO-UNEVOC Centre for Technical and Vocational Education and Training
- Joint session with the participants of the study tour on “Labour market-oriented skills planning and research mechanism in the sector of renewable energy technologies in Germany” : green skills development for a greening economy
- Greening activities at the Vocational and Technician College Butzbach
- Strategies on fostering greening TVET colleges in Germany: initiatives and experiences from Hesse and Baden-Württemberg
- Greening activities based on an Environmental Management System at Fritz-Erler-Schule in Pforzheim
- Role and possible activities of DHET in fostering the Greening TVET institutions approach in South Africa
- Development of transfer strategies and activities
- Final evaluation of the training course
- Presentation of evaluation results and planned transfer activities
- Agreement about further cooperation

### Greening TVET Institutions Initiative

#### Introduction to the concept & kick-off workshops

Kick-off conferences and consultation meetings in interested TVET colleges were held on 8 May 2013 in Johannesburg and on 9 May 2013 in Port Elizabeth in order to inform representatives of DHET, SETAs, municipalities and colleges about the GTI Initiative, its concept and procedure. Six TVET colleges showed interest in participating in the initiative. Consultation meetings with representatives of the senior management were held in five TVET colleges; key persons were nominated, focal topics were fixed (efficient usage of energy and water, renewable energy, avoiding of waste and waste management, promoting environmental awareness) and hints for training needs were given.

#### Box 5: What was expected from the participating TVET colleges?
- Sign a letter of agreement.
- Participate in the GTI Initiative (from May 2013 to presumably June 2014).
- Develop and implement greening activities in the college systematically.
- Provide human and financial resources necessary to develop, implement, document and disseminate the greening activities, including participation in programme activities.
- Allow video recordings and interviews with management and staff which can be used in the e-learning course “Greening TVET Institutions”.
- Nominate a sponsor (= member of the senior management), a project manager and project team members, facilitate them with responsibilities and accountabilities and support them by providing the resources required.
- Nominate key persons to attend a two weeks training course in Germany.
- Document and disseminate the greening activities.
- Cooperate with other participating TVET colleges as well as with GIZ and its experts.
- Provide rooms and workshops for training, workshops and meeting, if necessary.
Training course “Greening TVET Colleges in Practice”

According to special training needs identified in the initiation phase as well as to the requirements of the GTI approach 10 representatives of six TVET colleges, nominated to become project managers or members of project teams attended the training course “Greening TVET Colleges in practice”. In the training course, executed in Mannheim and other German cities from 17 to 28 June 2013, participants were introduced to the Greening TVET institutions approach in more detail. Furthermore they became familiar with relevant management concepts such as strategic process and project management, environmental and energy management as well as integrated management system. The participants learnt how to proceed and tried out and reflected different methods and instruments for involving stakeholders - not academically, but in a practical mode and supported by field visits to vocational colleges (Vocational and Technician College Butzbach and Vocational College Pforzheim) which already started a greening process. To get a maximum benefit from the introductory course participants were asked to prepare it by working through a preparation paper which was sent to them in advance:

Box 6: Preparation of the training course “Greening TVET Colleges in Practice”

To be able to consider your individual interests and particularly the specific framework conditions in your college, we would like to ask you to prepare a presentation to be presented on the first day of the training course.

Your presentation should contain the following issues:

• Please give an introduction to your experiences in greening activities, the initial situation in the relevant organizational units, planned activities of greening your college and the key persons and people to be involved by means of a power point presentation.

• Please take photos which document the initial situation in your college before starting the greening activities. Please ensure that the photos (the amount of photos is not limited) consider the starting situation and the people to be involved in regard to all five pillars of the Greening Colleges concept.

• To start the implementation as soon as possible after the training course, please make sure that appointments with key persons and other people to be involved into the greening process are already fixed.

• What do you want to experience in Germany, in order to get a maximum possible benefit from the training course?

• Is a quality and / or an environmental management system already implemented in your college? If yes, please present your management manual and / or process descriptions as a reference.

In the training course all participants developed strategies and concrete measures to implement greening activities in their colleges. Because (1) all projects focussed only on one or two topics (energy efficiency and/or waste management / recycling), (2) considered the special preconditions in their colleges and (3) were managed / promoted by very committed people the chance for implementation was estimated as being high.

Representatives of 6 TVET colleges were trained.

The participants developed strategies and concrete measures to implement greening activities in their colleges.
Conference on “Greening FET Colleges: Approach, Results and Perspectives”

In the conference, held on 8 November 2013 in Pretoria, all stakeholders involved in the Greening TVET Institutions Initiative came together to experience approach and activities, to reflect interim results and to discuss and work out recommendations how the GTI Initiative could be continued, disseminated and consolidated. After three introduction speeches and presentations of representatives of the six TVET colleges participating in the training course “greening colleges in practice” and lecturers of the training programme on renewable energy technologies the following issues were discussed: current challenges and how to address them; interim results and how to document and disseminate them; how to integrate other colleges into the GTI Initiative; and how to improve communication within the GTI network. Among others the working groups recommended preparing a beginners manual that should be developed in cooperation with the colleges and disseminated by DHET. Another substantial contribution of DHET was also seen in promoting the GTI Initiative and inviting other colleges to join in.

Programme

- Welcome and opening of the conference
- Introduction to the GTI Initiative: approach and activities
- Institutional frameworks for greening TVET institutions
- GTI: perspective of DHET
- GTI in practice: approaches and interim results of greening activities in the participating TVET Colleges
- Working groups
- Report and discussion of results of the working groups
- Summary and farewell

Training course “Introduction to the Greening FET Colleges Initiative”

Within a one-week training course, held at Central Johannesburg College from 11 to 15 November 2013, six participants – representatives of five TVET colleges and intended to become in charge of greening activities at their colleges – got an overview about meaning and examples of greening the economy and greening TVET in general and greening TVET institutions in particular. They identified environmental projects in their colleges and outlined aims and ideas as well as the challenges to be tackled with regard to the greening process. The participants developed workable transfer activities with regard to their individual working framework and to the process of greening their TVET colleges as well as measures on how to communicate their activities in the colleges and how to involve internal stakeholders.
Final conference on “Greening TVET Colleges: results and perspectives”

The conference on “Greening TVET Colleges: Results and Perspectives”, was organised in cooperation with DHET and DEA and took place on 13 May 2014 in Pretoria. Stakeholders involved in the GTI Initiative met in order to experience approach and activities, to reflect results so far and to develop and review perspectives on how the initiative could be continued and replicated in other TVET colleges. Additionally, the conference was also intended as an integral part of the GIZ exit strategy from direct support of the GTI Initiative.

In the conference representatives from seven TVET colleges presented their achievements indicating high levels of creativity and innovation in stimulating attitudinal changes and approaches to greening by staff and students thus ensuring greater efficiency, explicitly calculating cost savings that can be made using more efficient lighting, recycling etc. A representative of DHET was officially named to be the direct contact person for all colleges in this regard responsible to support and disseminate the GTI Initiative. Additionally a representative of the DEA indicated that the DEA would be willing to engage in further discussions with the DHET and GIZ about future support for the GTI Initiative, confirming willingness to enabling that more TVET colleges become part of the GTI Initiative. He indicated that the DEA is already funding the African Green Campus Initiative and there would opportunity and interest to bring the GTI Initiative and the African Green Campus Initiative closer together.

Programme
- Welcome & introduction to the programme and the objectives of the conference
- Greening TVET institutions: Initiative to mainstream sustainability into TVET colleges
- Greening TVET institutions in practice: presentation of approaches, activities, interim results, perspectives and lessons learnt by involved TVET colleges
- Greening TVET institutions: the perspective of the Department of Higher Education and Training
- Greening TVET institutions: the perspective of the Department of Environmental Affairs
- Focal groups: Proposals for replication and anchoring of the GTI Initiative including topics such as community, and employment dimension
Guide for practitioners on Greening TVET Colleges

One of the results of the conference on “Greening FET Colleges: Approach, Results and Perspectives” (8 November 2013) was a recommendation to “prepare a beginners manual that can be shared and disseminated by / with colleges and DHET”. This recommendation was affirmed by the participants of the study tour on “Fostering Greening FET Colleges in Practice” (23 to 30 November 2014). The manual should support the dissemination of the GCI and inform representatives of TVET colleges interested in greening their colleges as well as representatives of relevant departments (in particular DHET and DEA) about the approach, its context, procedure and good practices.

In close coordination with GIZ HCD for Technical and Vocational Education and Training and the TVET colleges participating in the initiative, a manual on “Greening TVET Colleges Initiative in South Africa: From individual competence development to institutional change. A guide for practitioners” was prepared and published in September 2014. There are some similarities between the South African guide and the publication you are reading now, but also fundamental differences. The main distinction is the focus. The South African guide aims at disseminating the GTI approach within South Africa by introducing the approach, the procedure and good practices. In the present publication the focus lies on situating the GTI approach and the experiences made in South Africa within GIZ’s HCD approach as an example for greening TVET institutions to support a sustainable development of economies and societies.

CSCL course on “Greening TVET Institutions”

A Computer-Supported Collaborative Learning (CSCL) course on “Greening TVET Institutions” has been developed and introduced in order to capacitate interested people in understanding the GTI concept in the context of changing economic and social requirements (“Green Economy”) as well as in implementing this concept in the framework of a sustainable organisational development process in TVET colleges. In particular the CSCL course shall be used in order to involve more colleges in the GTI Initiative. The draft version of the course was introduced and tested on the day after the final conference on “Greening TVET Colleges: Results and Perspectives” in May 2014. Remarks of the participants were taken into consideration when developing the final version of the course. Everybody responsible for or interested in implementing the Greening TVET Institutions concept in his or her TVET institution as well as persons simply interested in this concept is invited to attend the online course.

The CSCL course consists of the following features:

- about the course (short introduction about the background, the objectives and the target group);
- library (glossary, sources, videos, PDFs) and
- modules.

The CSCL course consists of 3 modules with 8 training units.
Entering the room “modules” there is an introduction to the course structure and content. From here the modules can be entered.

The course consists of three modules with two to three units each (overall: eight units):

- **Module 1: TVET for a greening economy**
  - Green(ing) Economy
  - Greening TVET
  - Characteristics of green TVET institutions

- **Module 2: Reference systems and sector specific approaches**
  - Environmental Management System
  - Eco-Schools Programme

- **Module 3: Topics, people and procedure**
  - Potential topics and focal areas
  - Involving people
  - Procedure

Every module follows the following structure: overview – introduction - index - objectives. The units’ structure is: preview – content - content pages & tasks - key messages. At the end of each module the learner finds a final test. In case of tutoring an additional send-in exercise is provided.

The CSCL course can be deployed flexible. It is self-explanatory and suitable for individual learning. All tasks are answered. The estimated time required for working through the course is around 26 hours. Tutoring is preferable, but not a must. If tutoring is intended tasks which require personal assessments can be led to a tutored forum on GIZ’s learning platform Global Campus 21 (GC 21). Naturally, the course can also be provided within a blended learning concept as well as (partly) in a training course. The course is available on GC 21, but can also be distributed by DVD.

In the course the learners are required to become actively involved in learning. They are required not only to decide their time and speed of learning, but also to interact with the learning content actively. All content pages are linked to tasks which only can be answered, if the text on the content page is read and understood or if the solution is found in a PDF, an external web page, a case study or an internal or external video. There is a well-balanced relation between content pages and tasks as well as between different media.

Table 3: Features of the CSCL-Course “Greening TVET institutions”

<table>
<thead>
<tr>
<th>Module / Units</th>
<th>Pages*</th>
<th>Links</th>
<th>Number of PDFs**</th>
<th>Videos</th>
<th>Tasks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Module 1: TVET for a greening economy (Duration: approx. 11 hours)</td>
<td>16</td>
<td>3</td>
<td>5</td>
<td>1</td>
<td>19</td>
</tr>
<tr>
<td>Unit 1-1: Green(ing) Economy</td>
<td>18</td>
<td>4</td>
<td>17</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unit 1-2: Greening TVET</td>
<td>26</td>
<td>3</td>
<td>4</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Unit 1-3: Characteristics of green TVET institutions</td>
<td>26</td>
<td>2</td>
<td>18</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Module 2: Reference systems and sector specific approaches (Duration: approx. 6 hours)</td>
<td>12</td>
<td>12</td>
<td>2</td>
<td>27</td>
<td></td>
</tr>
<tr>
<td>Unit 2-1: Environmental management system</td>
<td>20</td>
<td>4</td>
<td>3</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Unit 2-2: Eco-schools programme</td>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Module 3: Topics, people and procedure (Duration: approx. 9 hours)</td>
<td>28</td>
<td>4</td>
<td>5</td>
<td>34</td>
<td></td>
</tr>
<tr>
<td>Unit 3-1: Potential topics &amp; focal areas for greening TVET institutions</td>
<td>28</td>
<td>4</td>
<td>5</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td>Unit 3-2: Involving people</td>
<td>21</td>
<td>3</td>
<td>11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unit 3-3: Procedure</td>
<td>21</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overall</td>
<td>170</td>
<td>26</td>
<td>18</td>
<td>17</td>
<td>179***</td>
</tr>
</tbody>
</table>

* Only content pages (without overview, introduction, index, objectives, key messages, without videos)
** Without transcriptions of videos
*** Plus 40 tasks in the final test

The CSCL course can be deployed flexible.

Learners become actively involved in learning.
Training on Renewable Energy Technologies

Introductory course “Solarteur and Wind Technology in Practice”

In order to broaden green knowledge, skills and competencies of management and training staff of TVET institutions in the field of renewable energies, a two-week introductory course “Solarteur and Wind Technology in Practice” was executed. 16 representatives of merSETA and East London Industrial Development Zone as well as training staff of several TVET colleges and private training providers gained a first experience and orientation in two recognized training programmes: Solarteur, a standard in several European countries, which includes solar thermal applications, photovoltaic and heat pump systems, as well as in wind turbine technology. One of the substantial objectives was to work out recommendations for implementing green skills in the participating institutions in terms of teachers’ training requirements, equipment needed, approaches to integrate solar and wind technology issues in already existing courses resp. development of new courses, and cooperation requirements and other organisational requirements.

Results: The participants knew from first-hand experience skills requirements in the sectors wind and solar energy. In general, they were able to recommend their superiors and clients which skills are required, how German training providers attend to these requirements and what equipment is needed in TVET centres to meet these requirements. On the other hand, selection criteria for the nomination of participants for the advanced training in 2013 were discussed. Additionally, a video about the course was produced and disseminated in order to attract TVET institutions as well as potential lecturers for attending the advanced training.

Programme

<table>
<thead>
<tr>
<th>Date</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>11 – 14 September</td>
<td>Welcome and introduction to the topic&lt;br&gt;Skill development for a green economy&lt;br&gt;The German dual VET system and renewable energies (incl. field visits to a vocational college and a collaborative training provider)</td>
</tr>
<tr>
<td>15 - 16 September</td>
<td>Weekend / time for own activities</td>
</tr>
<tr>
<td>17 - 21 September</td>
<td>Introductory course in wind turbine technology at bfw / edwin academy in Bremerhaven</td>
</tr>
<tr>
<td>22 - 23 September</td>
<td>Weekend / time for own activities</td>
</tr>
<tr>
<td>24 - 28 September</td>
<td>Introductory course in solar technology (solar thermal and PV) at TVET centre of the chamber of skilled crafts Münster</td>
</tr>
<tr>
<td>29 - 30 September</td>
<td>Weekend / time for own activities</td>
</tr>
<tr>
<td>01 - 03 October</td>
<td>Extra field visit to a vocational college (focus: building efficiency)&lt;br&gt;Elaboration of transfer projects&lt;br&gt;Introduction to Global Campus 21&lt;br&gt;Evaluation</td>
</tr>
</tbody>
</table>

Renewable Energies Technology Training

The Renewable Energies Technology Training (RET) programme, attended by 16 TVET college lecturers, responded to the challenges of a green economy by supporting qualified lecturers in their continuous professional development and consequently increasing the knowledge and skills of students in respect to future technologies. The
programme was set to run for one year (from June 2013 to April 2014) and comprised four training modules which were executed in Germany (module 1) as well as in South Africa (module 2, 3 and 4).

Module 1 “Solar Technologies in Practice” (17 June – 6 July 2013; Hessische Landesstelle für Technologiefortbildung in Groß-Gerau, Germany) focused on an introduction to various areas of renewable energy (RE) areas, esp. photovoltaic (PV) and solar domestic water heating (SWH) systems, as well as vocational pedagogic and the development of learning and teaching material. Furthermore, the participants got the opportunity to visit the Intersolar Europe trade show and exhibition where they could make contact with RE manufacturers and suppliers.

Module 2 “Training on Solar Thermal Training Systems” comprised two parts and was conducted in Port Elizabeth College from 23 to 28 September 2013. The module was dedicated to the use of solar thermal and PV training equipment respectively purchased by GIZ as well as their implementation in and contribution to action-oriented RE classes at TVET colleges.

Module 3 was on “Installation of PV and SWH systems” and also executed in Port Elizabeth College from 25 November to 6 December 2013. It addressed the installation of PV and different SWH systems, considering practical training with hands on installation as well as theoretical lessons on aspects like commissioning, operation, maintenance, optimization and performance validation of SWH and PV systems.

Module 4 (“Planning, Designs and Installation of PV systems”), finally, took place in Central Johannesburg College from 26 March to 4 April 2014 and focused on manual and software-based planning and design of grid connected PV systems on the one hand and their subsequent mechanical and electrical installation (incl. site based design, constructing and commissioning). The design of the training started with knowledge of PV-use of the former training steps, running the whole process from the customers’ will to the realization and commissioning of a grid feeding PV power plant.

Furthermore, in order to facilitate a sustainable and action-oriented implementation of the acquired skills in class, relevant RE training systems and teaching materials were procured for the TVET colleges involved.

In the RET programme especially sectorial and technical skills with practical application, but also personal and social competencies were promoted. The participants developed transfer projects, such as building up training installations or PV systems for individual supply. They started implementing their new skills in training courses after the RE training systems and teaching materials were made available in the training workshops and renewable energy technologies became a consistent part of the NCV curricula at the latest.12 As they had established good relationships amongst each other, participants said they were willing to support each other by calling up, exchanging e-mails etc.

12 In the meantime this is the case (see box 4 on page 17).
2 Role and tasks of TVET institutions in the context of a greening economy

2.1 Need for greening the economy

In the 21st century there are a lot of global challenges to meet: The growth of population makes it difficult to fight hunger which is still a huge challenge to be tackled in parts of the world. The worldwide consumption of fossil fuels for energy production and the emission of CO₂ and other greenhouse gases involved is increasing. Climate change and its direct and indirect impact will change the living conditions all over the world dramatically. The oceans, forests and other relevant ecosystems are under pressure and there is a rapid loss of biodiversity. It is long since clear: Humankind is demanding much more resources and services than the planet can provide.

Technological approaches alone are unsuitable when meeting these challenges; instead a new social and economic approach is required. At the United Nations (UN) Conference for the Environment and Development, held in Rio de Janeiro, Brazil, in 1992, the international community agreed on sustainable development to be the global guiding principle for action. According to the definition of the UN World Commission on Environment and Development (WCED)\textsuperscript{13}, a development is sustainable, if it “meets the needs of the present without compromising the ability of future generations to meet their own needs”. The key concept of sustainable development is to keep the world in balance. The key thought is that, in the long run, we cannot live at the expense of people in other regions of the world or at the expense of future generations. The environment, economy and society mutually affect each other. There will be no long-term economic or social progress without a healthy and intact environment. At the same time, it will not be possible to protect the environment efficiently, if people have to fight for their economic livelihoods.

Within the overall concept of sustainable development the concept of a green economy has established itself on a global level as the new environmental guiding principle. It refers to an economy that is oriented towards ecological sustainability, economic profitability and social inclusion. The United Nation Environmental Programme (UNEP) defines green economy as an economy which “results in improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities. In its simplest expression, a green economy can be thought of as one which is low-carbon, resource-efficient and socially inclusive. Practically speaking, a green economy is one whose growth in income and employment is driven by public and private investments that reduce carbon emissions and pollution, enhances energy and resource efficiency, and prevents the loss of biodiversity and ecosystem services”.\textsuperscript{14}

\textsuperscript{13} WECD 1987
\textsuperscript{14} UNEP 2011, p. 19
According to the United Nations Industrial Development Organization the green economy approach contains a two-pronged endeavour:  

- **Greening of industries** – ensuring that all industries, regardless of sector, size or location, continuously improve their environmental performance through using resources more efficiently, phasing out toxic substances, substituting fossil fuels with renewable energy sources, improving occupational health and safety, taking increased producer responsibility and reducing the overall risks.

- **Creating green industries** – stimulating the development and creation of industries that provide environmental goods and services. This sector covers all types of services and technologies aimed at contributing to reducing negative environmental impacts or addressing the consequences of various forms of pollution. This includes material recovery, recycling companies, as well as companies that transport, manage and treat waste. Further examples are engineering companies that specialize in wastewater treatment, air pollution control and waste treatment equipment. The sector also encompasses environmental and energy consultants, as well as providers of integrated solutions, for example, energy service companies that offer design, implementation of energy saving projects, energy conservation, energy infrastructure outsourcing, power generation, energy supply, and risk management. Another segment is monitoring, measuring and analysis providers. Green industries also include companies that manufacture and install renewable energy equipment and companies that develop and produce clean technologies.

The transformation to a green economy - which also means a social transformation of lifestyles, habits and behaviour - is a big challenge, but also a big chance. Different countries face different challenges. However, in general the following opportunities are seen:

- Investments in ecological change are able to stimulate the development of technologies and innovation.

- Optimising energy and resource efficiency leads to significantly improved competitiveness of enterprises.

- Jobs of many existing workers (for example, plumbers, electricians, metal workers and construction workers) will simply be redefined as day-to-day skill sets, work methods and profiles are greened.

- By introducing new (greener) production procedures as well as by producing environmentally friendly products, new jobs can be created.

- Some employment will be substituted—as in shifting from fossil fuels to renewable, or from landfill and waste incineration to recycling.

- Certain jobs in economic sectors that are less environmentally friendly may be eliminated without direct replacement.

On balance UNEP is convinced that the greening of economies has the potential to be a new engine of growth, a net generator of decent jobs and a vital strategy to eliminate persistent poverty. So a transition to a green economy has the potential to benefit all: such as environment and climate, economy and employment markets and last but not least every citizen.

---

15 UNIDO 2011, p. 16
As yet there has been no consistent definition of green jobs. UNEP defines green jobs as “positions in agriculture, manufacturing, construction, installation, maintenance as well as scientific and technical, administrative and service-related activities, which contribute substantially to preserving or restoring environmental quality.” The International Labour Organization (ILO) considers a job green as one that helps to reduce a negative environmental impact and contributes to environmental, economic and social sustainability of enterprises and economic sectors while also meeting the criteria for decent work, viz. adequate wages, safe conditions, workers’ rights, social dialogue and social protection.

In practice it is not that easy to distinguish a so-called “green economy” from conventional economic sectors. This quickly becomes clear when looking at the various economic sectors and their close relationship all along the value chain. To assess a company or an economic sector to be green or not, an entire production chain has to be considered. Green products such as wind turbines, solar panels, biofuels, electric vehicles, sewage plants or waste treatment plants are not necessarily manufactured according to cleaner production concepts; the companies within the production chains do not necessarily respect human rights or offer adequate working conditions. Additionally, the manufacturers of green products use preliminary and intermediary products like generators, poles (for wind converters), electric engines, and measurement and control technologies etc. which are not necessarily labelled as green. On the contrary, they can compete with food production (like biomass plants) and they can cause ecological damages like the farming of biomass plants (corn, palms etc.) in monocultures. Therefore, it is not enough to look just at the final product but also at the production chain. This is the main reason why it is so difficult to identify specific green jobs with the specific green skills required.

In this publication the term “green” is used to highlight specific economic sectors which as a whole are highly relevant for nature reserve, environmental protection and climate protection such as renewable energy, sustainable forestry, green construction, organic agriculture, water supply, waste water treatment and waste management. Unlike this the term “greening” is used if the focus is on the process of transforming economic sectors to become more sustainable and environmentally friendly. Improvement of environmental performance, reduction of emissions, avoiding of waste, energy and resource efficiency are some of the main topics of “greening”.

In South Africa new green jobs are expected. South Africa has embarked on a major policy drive to invest in a green economy. The green economy has the potential to be a new engine of growth, a net generator of decent jobs and a vital strategy to reduce poverty. South Africa’s New Growth Path of 2010 identifies the green economy as one of the key sectors for employment creation with the potential for creating at least 300,000 additional direct jobs by 2020. New green jobs are particularly expected in the fields of natural resource management, waste management, green energy generation and energy and resource efficiency as well as emission and pollution mitigation. Besides this a wide range of economic sectors and therewith a lot of jobs will become affected by processes of greening the whole economy in terms of efficient use of energy and other resources, avoiding waste and pollution, etc. TVET is demanded to educate and train people to meet the new skills requirements arising in both, the green economy as well as economic sectors which are greening.

16 UNEP 2008, p. 35f.
17 See ILO/CEDEFOP 2011, p. 4
2.2 TVET – master key for a green(ing) economy

The importance of Human Capacity Development for sustainable development through technical and vocational education and training is undisputed. TVET should equip people with the knowledge, competencies, skills, values and attitudes to become productive and responsible citizens who appreciate the dignity of work and contribute to sustainable societies.\footnote{See UNESCO-UNEVOC 2004, p. 1}

Beside technical skills, raising awareness and a change of mindset are needed. Transforming the economy and society in line with the concept of sustainable development is only possible if people embrace the inherent values and attitudes of this idea, and if people possess the needed skills and are able to apply them in practice. This makes clear that integrating sustainability into the skills development sector cannot be reduced to individual vocational subjects or occupations. The challenge for TVET, then, is to re-orientate and re-direct its curricula with respect to the conservation and sustainable use of resources, social equity and appropriate development, and additionally with the competencies to implement sustainable practices at workplaces.

Both requirements of green jobs as well as the greening of jobs are the results of technological and economic changes in industry. Meeting these requirements in vocational education and training courses is not a new, but a common business for the skills development sector. New are the skills requirements which come up in this context:

- Employees have to understand the environmental impact of their occupations / jobs.
- They have to know, how they can contribute to a clean environment and avoid environmental risks and damages at their workplaces (e.g. by handling hazardous substances correctly).
- They need the knowledge and skills to use energy and resources efficiently, how they can avoid waste, re-use or recycle materials.
- A change of mindset is needed. Central is the ability and willingness to take on producer’s responsibility for the results of one’s work— of course within the employment’s limits to be respected.

These are skills relevant for the whole workforce and should be trained in every occupation and training course. Additionally in some occupations / jobs / industries and complementary to already acquired skills, special technical skills are needed, e.g. to install solar systems, to maintain wind turbines or to operate a wastewater treatment plant. Even these “green” skills are just special technical skills which in principle cannot be distinguished from conventional technical skills. The application is just different.

Box 7: The contribution of TVET to a sustainable development

Vision: A skilled and capable workforce that contributes to and benefits from a growing greening economy towards a sustainable development of our planet.

Mission: To provide adequate skills development which meets the requirements of a greening economy, and contributes to achieving the national and international targets of sustainable development and climate protection.
2.3 Greening TVET institutions

Skills development is the master key for an economic and social transition towards a sustainable development. Sustainable development requires a new mindset, a green transformation of the economy, and occupational as well as cross-occupational skills adequate to support the transformation process. TVET institutions are of vital importance to prepare the workforce to be able to meet the skills requirements of a greening economy. Since all generations of trainees / students spent a certain time of their lives in a TVET institution there is a good chance to reach many people and to train them to become ambassadors of greening process and to use and pass on their green skills in business and private life. It is not sufficient just to train technical skills but to raise awareness and to support a change of mindset – both with the instructors and the students – TVET institutions have to become green, too.

The vision of the Green TVET Institutions approach is the following: TVET Institutions are role models for environmental friendliness, as well as a source of inspiration, an innovative and profound training provider and accepted strategic partner for a sustainable development of their region. Green TVET institutions have a special profile and integrate green issues into education and training. They live what they preach and try to reduce the carbon footprint of their campuses. They integrate internal and external stakeholders in the greening process, train their trainers, provide further training for companies and improve the living conditions of their communities by means of green projects, informal training, technical support etc.

Greening is much more than just a new topic which could be left to committed individual teachers or executed in single projects additionally to the “real” subjects, a greening of TVET institutions cannot be achieved by piecemeal or ad hoc approach. Instead, a holistic framework is needed to transform TVET institutions in a comprehensive manner to support green society and green economy. HCD is corresponding to this holistic framework as individual competence development is always focused on institutional change processes in the frame of a given work environment of the individuals.
3 The Greening TVET Institutions approach

3.1 Overview

For the Greening TVET Institutions (GTI) approach introduced in this guide a concept issued by Majumdar was used. Based on a profound TVET performance that meets the skills requirements of the labour market Green TVET institutions follow a holistic framework that is built upon five dimensions to anchor sustainable development principles in the institutions:

- **Green Campus**: Permanently reducing the carbon footprint of students, teachers and staff within the TVET institutions.
- **Green Curriculum**: Meeting upcoming skills for green(er) jobs by integrating green issues in already existing curricula and/or providing new green training programmes and projects.
- **Green Research**: Fostering the development of a research culture in relevant areas not necessarily on an academic level but as a teaching and learning approach.
- **Green Community**: Extending sustainable development practices at community level by transferring knowledge to the community, as well as from bringing in experiences and questions from private life to school.
- **Green Culture**: Strengthening green values, ethical standards, attitudes and practices, because without values, without ethics, without the changing of our lifestyle nothing will happen.

Additionally to the original approach further elements are included into the GTI approach:

- **Profound TVET performance**: Greening TVET institutions meet the skills requirements of the labour market. Their education and training courses fulfil national / international standards. They understand the relevance of sustainability for their area of work, are willing and in a position to putting this knowledge into the teaching and learning processes. Teachers / instructors are well-trained, use adequate curricula, suitable methodology and cooperate with companies and other relevant stakeholders. The profound TVET performance is not part of the GTI approach in a narrower sense, but it is an important precondition. Education and training is the core task of vocational schools and colleges. If an institution is weak in this respect it does not seem to be appropriate to focus on greening, but at first improve the education and training performance. On the other hand, if a TVET institution tries to improve its performance, than greening might be a suitable reference topic.
- **Embedding of greening activities in the management system of the institution**: Following a systematic approach (executing an environmental review, identifying relevant aims and activities, implementing, monitoring, fixing results and updating measures) coordinated with or integrated into the corporate management system.

---

\[See \text{Majumdar 2010 and 2011. Prof. Dr. Shyamal Majumdar is the Director of the UNESCO-UNEVOC International Centre for Technical and Vocational Education and Training in Bonn, Germany.}\]
3.2 Principles of greening TVET institutions

Greening TVET institutions requires extensive organizational development (OD) and human capacity development (HCD) processes in which the principles and processes known from the general debate about OD and HCD are applied, such as:

- **Combining top-down and bottom-up approach**: In the beginning there is an individual or a group, who has an idea to start a greening project in a TVET institution. He or she will draft a project sketch and present it to the senior management; if senior management is convinced and committed, and the sketch is approved, the concept can be further developed and implemented. Initiatives from the “grass-roots”, i.e. from lecturers or students, are necessary and must be encouraged. However, this strategy must be supplemented with statements of willingness, the provision of resources and an acknowledgment of the activities at the “bottom” by the top management (Motto: greening is also a matter for the boss). As experience shows: In a long-term perspective organisations can only be greened, if both approaches are pursued simultaneously.

- **Assigning promoters on both strategic and operational level**: Without committed individuals who are dedicated to the topic and who press ahead with it in their organisation, greening will remain a marginal issue. If it involves more than individual measures that are relevant to the organisation, it is important that a person is found who can support and promote the project as a functional and process promoter (project or process manager) in terms of contents and organisation. On the other hand, it must be ensured that the project also has a promoter on senior management level who is sufficiently accepted and who has enough decision-making authority to implement the system. The top management has to set a good example. Simple changes in attitude can be adopted much more easily if the top management is committed and communicates this emphatically. There is no chance for implanting green issues in a TVET institution systematically and enduringly, if there is no sufficient commitment of and support from the senior management.

- **Systematic approach**: The GTI approach provides a holistic structure to implement greening issues systematically into relevant fields: campus, curricula, conducting green research activities, cooperation with partners and other institutions on community level, development of a green culture and integrate green issues into the school’s management system. Besides the GTI approach the ISO 14001 is an established environmental management standard that could be used to embed greening activities into a vocational college’s management system systematically. The Eco-Schools approach shows how greening processes can be implemented following a people-oriented approach.

- **Creation of a suitable organisational structure**: Generally, to plan, manage and document coordinated activities for greening an institution, temporary cross-status project teams are formed to look after the implementation process and to support the process manager on operational level. The establishment of a green committee allows involving representatives of all relevant stakeholders. It can steer the greening process on strategic level and ensures acceptance.

- **Cooperation with OHAS, quality and facility management**: Responsible persons in occupational health and safety (OHAS), environment protection, quality management and facility management are “natural allies” in a TVET institution who should be involved when starting a greening process. They have expertise in relevant topics, know the institution well, and are generally open to the new topic of “greening”.

- **Linking individual and organizational learning**: Particular effects can be expected if the environmental learning of staff and students and the environmental learning of the organization are linked with each other. Therefore it is important to train people in regard to the requirements of the greening TVET institution and to give feedback on what the institution has done and already achieved through its greening efforts.
“Living” the greening process: A green TVET institution cannot be created from one day to the next. It is a long-term process that, on the one hand, needs a high level of commitment, time-bound and financial resources as well as expertise, and on the other hand, it is a basically open process, and potentially at risk. The creation of guiding principles and participative organisational structures, as well as the orientation along environmental management systems are important prerequisites. But that alone cannot ensure that the corresponding measures will be permanent. The system freezes in its routine if it is not revised from time to time and filled again with life and more or less spectacular activities.

### 3.3 Getting started: Greening TVET institutions in seven steps

A systematic procedure to start and implement a process on greening TVET institutions contains seven steps that any TVET institution can adopt and adapt to the respective framework conditions:

- **Assignment of a process manager and establishing a green committee**: Like any other process greening needs somebody who takes on responsibly and manages and operates the process.
- **Establishing a green committee**: Representing all stakeholders the green committee is the central forum for steering the greening activities.
- **Informing and involving stakeholders**: Greening an organisation cannot be achieved by individuals but requires the involvement and collaboration of all stakeholders.
- **Developing a green policy and strategy**: In the green policy the TVET institutions demonstrates its commitment to a sustainable development; its strategy contains its strategic goals in regard to greening.
- **Conducting an environmental review**: A systematic integration requires a review and assessment of the environmental impacts of the TVET institution.
- **Developing a greening programme**: The greening programme reflects the green policy and strategy and provides information about objectives, activities, schedules and responsibilities.
- **Implementing, monitoring, evaluating and consolidating of greening activities**: To find out whether or not the targets laid out in the greening programme are successfully achieved, the progress is regularly monitored and measured; once in a year the greening activities are reviewed by senior management; new focus areas, aims and activities are fixed; the greening activities are continued, disseminated and consolidated.

**Please note:**

Although implementation of green issues costs a lot of effort, we should not get lost in details, but always keep in mind the global and regional challenges TVET institutions have to meet. When starting a process of greening, TVET institutions show that they are committed to take on responsibility for a sustainable future. In this respect greening is much more than separating waste, consuming less energy or having a poster presentation. Greening TVET institution’s vision is to educate and train a skilled and capable workforce that contributes to and benefits from a growing greening economy in its country. Their mission is to provide adequate skills development which meets the requirements of the greening economy and contributes towards achieving their country’s targets in regard to sustainable development.
Step 1: Assignment of a process manager

Like any other process, greening a TVET institution needs somebody who takes on responsibility and manages and operates the process. We call this person “Process Manager”. He or she is the internal and external contact person for greening the respective TVET institution. The process manager’s main tasks are:

- internal and external communication on greening;
- coordinating the green committee;
- coordinating the action teams (if applicable);
- preparing, chairing and documenting the meetings of the green committee;
- informing the members of the green committee about the GTI approach;
- developing a concept on greening the institution coordinated with senior management and green committee;
- developing and implementing a school-specific procedure on greening;
- preparing, implementing and documenting an environmental review;
- delegating tasks and setting time limits;
- regularly reporting to the senior management on greening performance;
- providing training for staff and students, if special knowledge and skills are required;
- supporting the involvement and recognition of the top management;
- attaining staff support beyond individual areas and functions.

If possible the process manager is supported by one or several temporary action team(s) of committed people. This can be mixed groups (staff and students) or homogeneous groups (staff or students). These action teams - it does not matter how they are called - are located on operational level. They support the TVET institution reducing its environmental footprint and are focussed on the following:

- special topics, e.g. preparation, execution and assessment of an awareness campaign;
- special steps of procedure, e.g. review of energy consumption and development, implementation of improvement measures;
- special locations, e.g. a special campus;
- special key elements of the greening TVET institutions approach, e.g. green campus, curriculum, culture or quality management.

Skills required by a process manager (examples):

- good knowledge of the vocational school’s structure and operating procedures;
- basic technical understanding;
- sound knowledge of the greening TVET institutions concept;
- involvement and enthusiasm for the subject of greening;
- communication skills.

Suitable positions in the TVET institution for becoming a process manager on greening (examples):

- Marketing expert;
- Facility manager;
- Occupational health and safety officer;
- Quality manager;
- Campus manager.
Step 2: Establishing a green committee

Additionally to the assignment of a process manager a green committee should be established. The green committee should represent all stakeholders; it’s the central forum for steering the greening activities and is located on a strategic level. The process manager shares responsibilities and tasks with the members of the green committee. Regular meetings should take place for coordination. The frequency of the meeting is based on demand; it should, however, take place once every quarter.

Box 8: Lessons learnt of South African project managers

In the initiation phase:
- Selection of the strategic persons to be a part of the initiative.
- Commitment from the top management; buy-in from staff and ownership of projects.
- Questions have to be answered such as: Are our support staff and lecturers knowledgeable and equipped to carry out this type of project? Who will be responsible for what? Are we knowledgeable enough?
- Do the site conditions allow for onsite waste management options? It is important for campus staff or learners to accept and fully understand the meaning and purpose of waste management. Public speakers for overall Environmental Health issues can assist with guidance and talks on several greening projects.
- The complete buy in at all levels of the organisation.
- Time. It is important to have time to answer questions. People have a lot of questions about a new concept they do not understand.

In the planning process:
- Development of guiding documents.
- Are the resources available? Can we afford them? Can we maintain them? What should we start with as priority? Developing a programme.
- Clear assigned roles and responsibilities. Effective teams essential as well.
- To get everyone on board, stakeholders, other campuses.
- Realistic and achievable goals.
- Again you have to make time – I have a lot of ideas but there isn’t enough time to implement. Communication process - it is important that everyone understands the Green Campus concept and its importance.

In the implementation process:
- The challenge here has been finding a suitable time to implement the initiative.
- Support from management and key staff members. Availability of resources.
- A programme with the following developed: Greening item desired to be achieved; start date and end date fixed; time frame allowed; responsible person / department for specific items named; funds allocated.
- Integrated waste management planning is a dynamic tool including aspects that range from policy making and institutional development to technical design of integrated solutions for the handling and disposal of waste. All the following procedures will be taken into account: Overall waste problematic, legislation, description of national waste policy and prevailing principles, description of objectives set up in specific areas, assumptions for planning, proposals of scenarios, setting goals and targets.
- The changing of mind-sets of all role-players and stakeholders.
- Time is a deciding factor. Communication is very important.

The green committee’s main tasks are
- ensuring that all stakeholders of the school community are represented in the decision-making process;
- integrating the greening programme within the school development plan;
ensuring acceptance and “open doors”;

• steering and coordinating the greening process at the school;

• supporting process manager and action teams;

• coordinating planning and implementing the projects (according to budget, time and quality);

• developing an effective organisational structure to integrate the greening activities into the operational organisation;

• developing, implementing and monitoring the school’s green policy and strategy;

• developing a greening programme;

• monitoring and evaluating greening activities.

Step 3: Informing and involving stakeholders

Greening an organisation cannot be achieved by individuals. It requires informing and involving stakeholders. Important internal stakeholders are

• CEO / principal,

• senior management,

• CFO,

• campus manager,

• teaching staff,

• admin staff,

• facility management,

• students.

Important external stakeholders are

• DHET,

• SETAs,

• local government,

• private institutions (e.g. contractors, Eskom),

• companies,

• local industry,

• parents.

They all can support or hinder the greening process to a certain extent. Internal and external stakeholders should be regularly informed about the greening activities of the TVET institution. As far as possible and relevant they should be involved in the greening process.

Step 4: Developing a green policy and strategy

The TVET institution’s commitment to a sustainable development finds its expression in a green policy and its strategy which contains its strategic goals in regard to greening. The green policy is meant to

• present commitment regarding greening to internal and external stakeholders and

• lead the greening activities in the college.
Sometimes it is said that an eco-policy is just another policy paper that will disappear in the drawer. If this happens in an institution then the basics of organizational learning and development as well as the advantages of managing by objectives and processes are not understood.

**Box 9: Environmental policy**

According to ISO 14001 the organisation’s environmental policy has to:

- be appropriate to the organisation’s nature, scale and environmental impacts caused by activities, products and/or services;
- include a commitment to
  - continual improvement,
  - prevention of pollution and;
  - compliance with all applicable legal requirements, and with other requirements to which the organisation subscribes;
- provide the framework for setting and reviewing environmental objectives and targets;
- be communicated to all employees and others working on behalf of the organisation;
- be available for the public.

Sometimes it is said that an eco-policy is just another policy paper that will disappear in the drawer. If this happens in an institution then the basics of organizational learning and development as well as the advantages of managing by objectives and processes are not understood.

In the context of greening TVET institutions it is important to emphasize that a college accepts the challenge of sustainable development and that it responds to it in a college-specific manner. This includes a commitment to continuous improvement of the ecological performance, but focuses on educating and training people to be able to contribute to the greening of economy and society of the respective country. It should be clear that the green policy should be an expression of the overall college’s mission statement and by no means separated.

**Step 5: Conducting an environmental review**

A systematic implementation of green issues requires a review of the direct and indirect environmental aspects and an assessment of the environmental impacts of the TVET institution. The environmental review is crucial to understanding the current environmental situation in the organisation and provides the basis of the TVET college’s greening programme.

It has to be determined which domain the review should refer to. This can be the whole college, a campus or a training workshop. It is also possible to focus on one topic such as energy, water and/or waste or several topics. However, the analysis should always cover all six key elements of the GTI approach.

A rough analysis will shed light on the energy and resources demand profile and the amount of consumption in past years:

- **Survey consumption rates**: Subscriber contracts and tariffs, delivery receipts and bills depict an overview over amount and temporal progression of the overall energy consumption in the TVET institution for the various energy-forms and media.

---

20 Direct environmental aspects are activities over which an organisation can be expected to have an influence and control (e.g. consumption of material, energy and water; waste and waste water production; usage of hazardous substances; CO₂ emissions and biodiversity on the school grounds. Indirect environmental aspects on the other hand are current or potential activities over which the organisation can be expected to have an influence, but no control such as positive environmental impacts by environmental education / training, traffic or environmental impacts of suppliers.
Detect “energy-paths” through the college: Which installation is provided with which energy source?

Identify main consumers: The energy consumption can be allocated to individual consumers by electricity meters, heat counters, gas meters as well as control reports from meter controllers. In case there are no meters, the energy-demand of individual installations can be estimated by their default capacity, average capacity and service-time (service hour counter).

In the same way materials (raw materials, operating and auxiliary materials), water consumption, waste production etc. can be analysed.

Results should be documented.

It is highly recommended to prepare the results in the form of charts and graphs. Additionally, good practices should be considered in the environmental review as well: Do lecturers already integrate green issues in lessons or training courses? Are there greening activities already going on like turning off lights and computers when not needed, making full use of paper and materials, recycling in the classroom or encouraging waste separation?

Focus on environmental aspects which are ecological relevant and can be improved.

The greening process should focus on environmental aspects which are ecological relevant and where the TVET institution has opportunities to improve its performance. The relevance of an environmental aspect can be assessed in regard to:

- their ecological impact (high impact, average impact, low impact), and
- the opportunities to influence the aspect (high, average or low influence potential).

Step 6: Developing a greening programme

The greening programme reflects the green policy and strategy, and provides information about objectives, activities, schedules and responsibilities. The greening programme is the core of the greening process in the TVET institution.

Developing a greening programme is divided into two phases:

1. Identification of fields of action: Linked to the college’s strategy and based on the results of the environmental review, relevant fields of action are to be identified which shall be improved. Of special interest are improvement opportunities that are easily implemented and cause few or no costs, so-called none or marginal investment related measures (“low-hanging fruits”). If being a beginner in greening we suggest focussing on a few relevant topics such as energy efficiency, water saving and/or waste management and to consider how the school’s performance can be improved in respect to this or these topics in all six key factors of greening TVET institutions.

2. Determination of objectives and improvement measures: For the selected fields of action, concrete objectives and improvement measures or projects are being derived. A detailed documentation of the individual measures in terms of a chart is highly recommendable. Along with the very measure, responsible persons, estimated costs and the final deadline will be noted.

Please note:

Keep the plan practical, focusing on what can be achieved realistically in light of technical equipment, budget, schedules, school breaks and graduation dates. Not every objective can be achieved in one year. Better to set smaller targets (e.g. reducing electricity consumption at XY campus by 10% until ...) than bigger ones. Then another target in this respect can be defined in the following year.

The sum of these different objectives and activities form the greening programme. It has to be discussed in the green committee and approved by senior management.
**Box 10: Recommendations of South African project managers**

- Select your team wisely, the team you select can make or break your initiative.
- Select a dedicated group of individuals from different departments to establish a green committee. Assign clear roles and responsibilities for the groups.
- Have the head of the institution be on board and pass on the message of the new direction (greening) the school will be taking.
- Engage students as often as possible.
- Don’t forget to engage general workers.
- Start awareness immediately to ensure all are aware, so that all efforts towards greening are well understood and procedures are followed correctly.
- Awareness could also cost more time than financial cost, so there is no excuse to start awareness immediately, when other resources are installed, all involved understands its functions and purpose.
- Carry out energy audits determine what your average cost and saving would be for going green via energy and water etc. then present it to top management with statistics as they would be keener on acceptance when figures are presented.
- Scope of a master plan: what are the types and amounts of waste in studied geographical areas? What are the priorities and needs of different sites? Specific objectives as they are provided either by legislation or by specific local priorities and conditions.
- Get yourself thoroughly organised and informed on the process and do lots of research.
- Start small – implement an idea you can handle with your normal workload.
- Get support from your campus manager.
- Create a community where different colleges can interact and share ideas; schools should not be an island but a great sharing hub.
- Consider catching up with other institutions and be on an international level where greening is concerned as in my personal opinion, we may have started later than others globally.
- There is reuse or recycling opportunities available for many waste streams, even hazardous waste. Reuse and recycling options should be considered before other options. Communities should plan for waste segregation in advance of an incident in order to increase the efficiency and effectiveness of their waste management activities.
- Add green modules into the curriculum.

**Step 7: Implementing, monitoring, evaluating and consolidating of greening activities**

The greening activities are being implemented and supervised by the responsible persons or action teams respectively. To find out whether or not the targets laid out in the greening programme are successfully achieved, the progress is regularly monitored and measured. This is done by the process manager in close coordination with the green committee. The green committee also has to decide what to do to support the implementation of special activities if there are unforeseen obstacles coming up. The implementation of the improvement activities and projects should be embedded in an information and awareness raising campaign. Everybody in the college or at the campus should know that the college is committed to sustainable development and that everybody is requested to contribute.
After a year an internal audit should be done by the process manager to evaluate:

- What has been achieved so far?
- What is still open?
- What has been a success?
- What has flopped?
- What lessons can be learnt?

Additionally, suggestions for new objectives and activities should be considered.

The results should be summarized in a report and be presented to both green committee and senior management. It is important that the senior management is involved, because it is the task of senior management to review greening activities to ensure its continued suitability, adequacy and effectiveness. This management review shall address the possible need for changes to green policy, focus areas, objectives and activities in the light of audit results, changing circumstances and the commitment to continuous improvement. The results of the management review should be integrated into the evaluation report and presented to the college staff and learners. In the following year the greening activities are continued, disseminated and consolidated.

**Please note:**

The evaluation report should not only contain programmes and statistics, but also success stories and profiles of people involved in the greening process. This is an important issue, because the feedback on the consequences of the greening activities can influence attitudes and values of people and thus enhance eco-friendly behaviour.
Greening TVET institutions: examples and experiences from South Africa

4.1 Procedure

After running two kick-off workshops in Johannesburg and Port Elizabeth in May 2013, which were attended by representatives of DHET, MerSETA, EWSETA and TVET colleges, as well as after several technical consultation meetings at interested TVET colleges, a first group of representatives of TVET colleges was trained in a two-week course on “Greening Colleges in practice” in Germany in June 2013. The overall objective of the training course was to enable the participants to initiate, coordinate and sustain selected institutional greening strategies and activities at their TVET colleges. On completion of the programme, the participants should

- be familiar with international approaches of greening colleges and are able to critically review it with regard to the TVET college situation (challenges and solutions);
- have outlined their aims and ideas as well as the challenges to be tackled in regard to the greening process in their TVET colleges;
- be able to identify, implement, manage and evaluate environment projects within their TVET colleges;
- be aware of the importance of internal and external communication;
- have developed concrete transfer activities for implementation at their workplaces;
- have established a community of practice.

In the training course the tasks of TVET in a green(ing) economy were discussed as well as the Greening TVET Institutions approach. German vocational colleges, advanced in greening, were visited in terms of explorations. Reference systems for greening TVET institutions were analysed in regard to how they could support a systematic procedure of implementing green issues in vocational colleges. Communication and cooperation in processes of greening TVET institutions was another focal topic in the course. Within the course each participant developed a transfer project with objectives as well as a procedure and detailed activities to be implemented in the individual TVET colleges after the course.

The participants continued communication and cooperation to each other on the Global Campus 21, the GIZ knowledge portal for international advanced training and cooperation. If needed they got technical support on questions coming up in regard to their greening projects.

In November 2013 another group of representatives of TVET colleges interested in participating in the Greening TVET Institutions Initiative were trained in a one-week course, entitled “Introduction to the Greening FET Colleges Initiative” in Johannesburg. The objectives and topics were similar to the two-weeks training course, but less ambitious. Also here, participants developed transfer projects to be implemented after the course and they joined the online-community as well.

In the following, interim results of the participating TVET colleges are presented in regard to the pillars of the Greening TVET Institutions approach. The colleges focussed on easily realizable topics like efficient use of energy and water and waste management and they did this very successful. On the other hand the examples show that most of the colleges proceed systematically and cover in sum all six key elements of the GTI approach.
4.2 Interim results

Green Campus

Characteristics

Based on the philosophy of practicing what is being preached it is intended to reduce the ecological footprint of students, teachers and staff within the TVET institutions. The operation of the buildings, machines, equipment, tools and materials, as well the design of the buildings and the school grounds shall become environmentally and resource friendly. The most important fields of action are:

- Reduction of energy consumption,
- reduction of water consumption and pollution,
- reduction of waste generation and recycling,
- control and correct handling of hazardous materials,
- minimisation of air pollution,
- environmental friendly travelling and transport,
- healthy and environmentally friendly food and food services,
- green landscaping & consideration of biodiversity on the school ground,
- green construction & buildings.

Not all topics have to be covered at once. For beginners the focus should be mainly on:

- Reduction of energy consumption,
- reduction of water consumption and pollution,
- reduction of waste generation and recycling,
- control and correct handling of hazardous materials.

Examples: Efficient water consumption

Boland College: Installation of drinking fountains
In order to reduce the use of plastic bottles at the campuses and to introduce a system that seeks to recycle water back into the garden drinking fountains were installed at all five campuses / sites: Stellenbosch, Strand, Worcester, Paarl and Caledon. The initiative, originally taken by the facilities department, was well accepted by the students. The results are a cleaner and greener campus and reduced water wastage.

Boland College: Installation of motion sensing water taps
A lot of water is wasted in bathrooms because taps are not turned off properly after usage. As a result of a decision by the college’s Executive Committee to revamp the facilities and make them as friendly to the environment at large, motion sensing taps have been successfully installed at the head office.
Examples: Efficient energy consumption

Boland College: Installation of motion sensing lights

Often lights were not switched off after leaving the rooms. The lights would also be “on” on broad daylight. In order to reduce this wastage of electricity motion sensing lights have been installed at the head office. Even though this system is a bit expensive than usual the assets and procurement department is convinced that there will be a significant saving on the electricity bill on the long run.

Boland: Small stickers on all light switches in the college

Everybody, management, staff and students can make a great impact on their immediate environment (offices, computers, etc.). In order to create awareness on saving energy stickers have been designed by the Stellenbosch campus and developed by the procurement channels of the marketing and corporate communications department. The green team approved the designs and now they are placed on light switches, PCs and printers all over Boland College’s campuses and sites.

Boland College: Greening the fleet

In order to reduce both air pollution caused by exhaust fumes and the fuel bill Boland College the executive committee and college council decided to change the entire fleet to more eco-friendly vehicles. VW POLO 1.4 diesel BLUEMOTION were procured and branded for all five campuses and head offices. Because these vehicles are fuel efficient there has been a significant drop in the fuel bill of the college.

Eastcape Midlands College: Natural instead of electric lighting

On Brickfields Road Campus green issues were made provision for in the process of reconstructing a building. Wherever possible, natural lighting was considered. Experience shows: Even in classrooms natural lighting is sufficient so usually there is no need for electric lighting. The photo shows a walkway which is approximately 30 metres long with clear roofs. There are electrical lightings installed, but there is no need to use them during the working hours.

Northlink College: Saving of 10% of the college’s energy cost

The green committee and the principal decided that the focus of the Northlink goes green campaign should be first on energy to save 10% of the energy cost of the entire college (all seven campuses). The principal agreed that all savings in the college’s electricity bill could be used to fund further green projects. Data was collected of what electricity cost was per campus and it was discovered that the total electricity bill for Northlink College per annum was approximately R3 million. At Belhar Campus a few spot checks over a period of a month revealed that not everyone was energy conscience and although computers were off at night, they
were left on during the day, even though there were no students or staff. Emails were sent to all staff to switch off lights, computers and equipment when not in use. Additionally the green marshals on campus reminded the people to save electrical energy. Green marshals were also invited to visit a hotel that has very green features in terms of design and layout. This was done to inspire them to look at their campuses in a new manner so that proposals of how change can occur on their campuses could be spearheaded by them.

The situation with the switching off of lights is better than before the campaign but still lights are randomly left on. In order to improve the situation the IT department did some research and is in the process of installing more energy efficient computers in the computer laboratories. This has the effect that the computer rooms will require almost 20% less power and as the computers use less power and dissipate less heat, less dependence on energy hungry air-conditioners is required adding to our overall energy savings. A quotation to replace fluorescent lights in offices and offices with energy efficient fluorescent lights and LED lights was sought. It is not feasible for the college to embark on this project yet.

**Port Elizabeth College: Electricity savings**

An advisor from an electrical company was called in to check the state of lights in Victoria campus and advice on energy efficiency measures, needed budget and ROI. The outcome was an audit report on all light sources on the campus, with a proposal on upgrading to new, energy efficient technology (CFL and LED). It also includes costing and ROI calculation, which is very favourable at less in two years. At the moment the project manager is trying to get the budget released for this upgrade. Besides, old style lights have been replaced by energy efficient lights.

**Examples: Waste management**

**Eastcape Midlands College: Establishment of a waste management system**

One of the first projects of the greening committee was to improve the college's waste management system. Service providers have been procured; a needs analysis has been conducted and a programme for waste management has been identified and by now a waste management and recycling programme established that shall be rolled out to all campuses. The college uses the already existing bins and puts stickers on them in different colours according to the different types of waste: plastic, glass, tin cans and paper. The stickers were available at the waste management company. Inside the buildings cardboard boxes are used for sorting paper from waste. The boxes have been provided by the waste management company for free. Now the green committee is thinking about communication with students: What do they have to know to separate the different kinds of waste? In this respect an awareness raising campaign is planned.

On Park Avenue campus there is an internal waste management site where the waste is collected. The waste company comes once a week to take it. On a day of action the different kinds of waste were separated. Even managers and lecturers participated in this action to show that even management and lecturers are committed and waste separation is something everybody has to consider, not only students. It was a single action. But now it is a running system and usually happens
weekly. The company supplies the bags and big bins, etc. and gives the college a small rebate when the waste is separated.

**Northlink College: Cooperation with a recycling company**

Initially research was done on how waste management at each campus could be realised. It was thought that the resources at each campus could be used to fulfill this function. But this didn’t work. As a pilot the contractor which provided the cleaning of the campuses was used at Belhar Campus to start collecting cardboard, copy paper, plastic bottles and aluminium cans. However, some of the cleaning company staff soon did only recycling and no cleaning, and thus another solution was sought. The project manager for greening, Mr Terence Slade, engaged an independent recycle firm. This firm now collects the recyclable products (all the above mentioned recyclables, as well as scrap metals and scrap copper), weigh it and pay the college according to predetermined /agreed rates for products recycled. This is taking place regularly on all campuses.

Going for an independent contractor has the advantage that normal collection of recycled products can be managed by the contractor and the college can continue with its functions without intervention. But the idea, to have the capacity in-house eventually, is still there. Mr Heinrich Snyders, project manager assistant for greening at Northlink College, draws the following conclusion: “Maybe in the college sector it is better to get in outside help initially. Trying to manage the recycling ourselves was not an option as all role-players have other focuses at present. However they see the recycling taking place and their mind-sets are being changed slowly to see that recycling is an essential part of College Life and should become part of normal existence outside college life as well.”

**Port Elizabeth College: First steps in regard to establishing a waste management system**

At PE College one of the major steps towards greening was identified being the waste management. At present the waste is not separated at all. It is removed from the different campuses once a week by different service providers. All is then loaded to the municipal landfill site. The situation is difficult to handle, since there is no municipal recycling service in place. So the first step was doing research for different private service providers and initiatives offering waste separation and recycling services. A specification defining the requirements for an appropriate service provider was written and quotations from three different service providers and also for recycling bins were obtained. For the calculation of budget needed for the new recycling bins an Excel sheet was designed to count all places where bins should be placed and multiply them with the prices of chosen models. At present the project manager is trying to get final approval for the purchasing of bins and the switch-over to new service providers. Once this will be in place, staff on the different campuses will be informed and awareness measures will be planned.
Port Elizabeth College: Office paper collection
In the course of finding a new service provider for recycling a young lady who had just started up her waste management company offered to provide cardboard boxes for three different campuses to collect office paper. She started to bring in the boxes and placed them in different strategic areas. She regularly collects the paper and recycles it.

Port Elizabeth College: Toner cartridges collection
Empty cartridges are collected by an agent for the Chris Burger/Petro Jackson Fund. The cartridges get collected, refilled and are sold again. The profit goes to the fund, which assists the Quad Para Association of South Africa. Staff in IT and at Victoria site, at Russell Road Campus and at Strandale Campus have been informed to collect and forward all used cartridges to a designated collection point.

Umfolozi College: Recycling of paper
At Chief Albert Luthuli Campus of Umfolozi College office paper is collected and sent to a local training centre for students with physical and learning disabilities. There the students develop motor skills by separating paper from other items such as plastic before sending off to recycling. The green team at the campus decided to send the paper first to the training centre because of the human aspect and also to do our bit for the community.

Green Curriculum
Characteristics
System expertise and shaping skills as well as the capability and willingness to take on producer responsibility are measurably promoted as objectives of education and training programmes. Needs of the economy and requirements of Education for Sustainable Development (ESD) are systematically taken into account in development, implementation, and further development of education and training programmes. To meet upcoming skills for green or greening jobs greening TVET institutions integrate green skills requirements into existing courses (e.g. green basic skills). If required, new courses oriented to green skills needs have to be designed (e.g. with focus on energy and resource efficiency and/ or renewable energies). Greening TVET institutions are also used as learning laboratories by means of adequate equipment which enhances explorative learning. The capacity of teachers and instructors has to be developed to enable them to provide these kinds of training.
Examples

Eastcape Midlands College: Training in renewable energies in a green energy training workshop

At Brickfields Campus training in respect to indirect solar water heating is provided within the BEAT programme. A training module is used in the classes and the lecturer teaches the concept and how it works so that the students become familiar with the technology. Besides this training module students can see a solar water heating system in practice, because a direct gravity feed geyser has been installed to supply the bathrooms, kitchens and so forth mainly on Brickfield Road campus. In addition to those programmes in regard to PV installations and wind energy are planned. In order to do this more professionally, a new green energy training workshop is under construction. It shall be completed by May 2014 and shall contain all training equipment needed. Electricity gained by PV modules and wind turbine will be fed into the grid. All technologies will be used as training models because all the metering will be inside our new green energy training workshop. The lecturer was trained in GIZ’s Renewable Energy Technology Training programme. The initiative was started by the Dean of Occupational Training and a lecturer. Funding has been made possible by the EWSETA and we planned to implement the programme with the funds which were made available to the college. It is expected to generate at least 85 000 kilowatts per year. The return on investment would be at least 12 years.

Northlink College: Solar thermal installation and maintenance course

In order to assist unemployed youth in finding jobs in green industries, the college is providing a solar thermal installation and maintenance course at Belhar Campus. After identifying the project, two lecturers have been sent on training for the solar thermal course (train the trainer). Course material is available but additional material will be added to create a manual and learning material. Northlink is accredited to offer the thermal course as part of the plumbing course.

Northlink College: Solar thermal installation and maintenance course

Northlink College sees photovoltaic as a natural add on to their electrical courses. It will /has also become part of the National Technical Vocational (NCV) curriculum. In order to provide the course a lecturer, Mr Ronald Barnard, has been trained within the Renewable Energy Technology Training programme. A venue has been partially built in the electrical workshop to offer the course (a second mezzanine floor was constructed for this purpose). All theory/ practical training activities will be on the Belhar Campus; all on-site training will be conducted on all campuses. The activities are still in process and proceeding steadily.
Green Research

Characteristics

Externally, research interventions, done in cooperation with universities, other research institutes and industry, e.g. in the areas renewable energy (solar heating and cooling, PV), energy and resource efficiency (efficient lighting systems, waste management) and green innovations, serves the purpose of bridging campus-wide initiatives to respond to the needs of industry and community. Internally, it supports the scientific and technical basis for undertaking day-to-day campus-wide green initiatives and undertaking scientific research undertakings, e.g. by testing and comparing performance and efficiency of different types of solar systems etc.

Examples

Central Johannesburg College: Constructing of a dome shaped building for low cost housing

In cooperation with Wits University, the Central Johannesburg College designed, constructed and evaluated a dome shaped building for low cost housing. The dome shaped house was meant to enhance cooling instead of using air conditioning. On top of the roof there is a small space where natural light gets reflected inside. The outside wall of the building is painted in a bright colour, whereas the inside is painted in a light colour. The reason: darker colours absorb heat more than lighter colours. The installation of photovoltaic cells around the dome enhances heating during winter. In the entire building shell sensors are integrated, especially to measure outside and inside temperature.

Eastcape Midlands College: Installation and calculation of LED lighting

Reduction of energy consumption has a double effect: saving costs and decreasing environmental impacts. Lecturers for electrical engineering of Park Avenue Campus conducted studies on the different types of LED fitting and which were suitable for the different areas also keeping in mind to confirm with the legal luminance standards in each area. They choose appropriate LED lighting for the different purposes and installed them not only on their campus but also on Charles Goodyear Campus. The fitting is exactly the same. Replacement is very simple: The conventional tubes are taken out and replaced by the new ones. LED lights are available in South Africa, but they are more expensive than conventional tubes. The LED type light fittings seems to be a good substitute for conventional lighting as there luminance is not inferior; they save up to 80% of electricity, however price at this stage is more expensive.

Within an energy audit the following calculation was made:

- Cost of installing energy saving bulbs inclusive of labour: R 344700.00
- Rebate from Eskom: R 57346.47
- Cost: R 287353.53
- After 2.8 years there is a saving of R 100,000 per year.
Green Community

Characteristics

Greening TVET institutions see themselves as a nucleus of greening and strategic partner for the sustainable development of their region. Through local, regional and supra-regional partnerships they build on their skills and make them available to their municipalities, the local economy and other regional stakeholder groups. Greening TVET institutions extend their activities and practices to the community level and participate actively in the sustainable development of their communities e.g. by offering formal and/or informal training (installation of solar heaters, establishment of a waste management system etc.), supporting projects to solve local problems (installation of PV based lighting systems, improvement of water supply and/or waste water management) and providing training courses for local industry concerning green issues. Greening TVET institutions join with others to form a network. They use the network for exchange of knowledge and experience, as well as for gaining other TVET institutions for alignment alongside principles of greening.

Example

Boland College: Stellenbosch campus involved in “Plant a tree” initiative

NCV Life Orientation (skills) Level 2 curriculum spells out that the students must get involved in a community project. A wide range of activities come into question. The fundamentals faculty of Stellenbosch campus specifically decided to execute this task by going to the local primary school to plant trees. And so a group of students accompanied by their teacher and representatives of campus and faculty management went to St Idas primary school and planted several trees. Now it’s on the school to take good care of them.

Green Culture

Characteristics

Greening TVET institutions provide an exemplary space for living and learning. They have a value orientation which embodies reciprocal respect, esteem, and acceptance of responsibility, provide a healthy workplace and promote maintaining health among the teachers. Greening TVET institutions take the concept of participation seriously. They promote individual responsibility of staff members and apply the concept of participation to teachers, students, and administrative staff by connecting top-down and bottom-up approaches. Even if the original initiative on greening comes from individuals, a systematic greening of TVET institutions cannot be done by a small group of committed individuals alone. It only can occur if all relevant stakeholders are informed about and involved into the greening process. Staff and students can significantly contribute to greening the TVET institution, e.g. by efficient consumption of energy and other resources, because they know their workplace best or have to learn what to consider respectively. Only when actively involved into the greening strategies of the TVET institution and when sensitized, motivated and qualified for greening their workplace, training workshop, office etc. they can detect improvement potentials and shortcomings and eliminate these at an early stage. Experience shows that ultimately those institutions have the most motivated staff, which focuses on the
involvement of their staff within the framework of an implemented company and leadership culture. This way, creativity and competence of the employees can be used for an advancement of greening, and create an acceptance of this topic. Moreover, it appears that a constant and systematic course of action yields a more lasting effect than singular, spectacular campaigns.

**Example**

**Boland College: Students at Paarl Campus involved in green week festivity**

Mr Iwan Hartman, campus manager of Paarl campus, and his colleagues were wondering: How can student’s environmental awareness be improved? How can attitudes and behaviour toward their immediate environment be changed? It was clear from the beginning that the answer could not be found in regulations or instructions. Their idea: organising a green week festivity with lots of games and space to challenge creativity and team spirit. At the beginning of the green week students from different programmes at Paarl campus were required to choose a “green” theme to send positive green messages to the entire campus. They selected a wide range from recycling, prevention of pollution, saving water, saving electricity, etc. Students could choose any method to convey their message, be it drama, song and dance, fashion show, posters or others. The different groups of students were competing with one another and the winning team would win different prizes. Some of the prizes were cinema tickets, McDonald’s vouchers, Boland College paraphernalia, etc. The green week was executed magnificently. The students really worked hard and had lots of fun while participating in these activities. The organisers were sure: the general attitude towards the environment has certainly improved.

**Management Integration**

**Characteristics**

Greening TVET institutions is a leadership task. It is born by the school management and is anchored in the organisation by attributing official responsibility and personal responsibility. Greening TVET institutions have a school-specific green profile, codified into the organisational mission statement. They have developed strategic development goals, which are carried out and put into practice within defined processes and through strategic projects. Responsibilities and accountabilities are fixed on all levels of management, staff (both technical and administrative) and students. Greening is a part of the school’s integrated quality management. As continually developing teaching and learning sites, green TVET institutions regularly and systematically assess the results of their activities. They evaluate the results and deduct consequences for future action, in the spirit of on-going improvement.
**Examples**

*Boland College: Development of an environmental policy*

<table>
<thead>
<tr>
<th>Environmental Management and Sustainability Policy of Boland College (extracts)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Scope of the policy</strong></td>
</tr>
<tr>
<td>The policy is applicable to all students and employees of Boland College.</td>
</tr>
<tr>
<td><strong>Purpose of the policy</strong></td>
</tr>
<tr>
<td>The purpose of the policy is to establish guidelines for minimising the environmental impact of the activities within Boland College through supporting sound principles and implementing good practice, and by continuous improvement in environmental performance. The College will seek to develop an ethos of environmental responsibility in all its staff and students as well as in the management of its assets. The policy relates to strategic objective 6: Continuously improve sustainable environmental performance in the College community.</td>
</tr>
<tr>
<td><strong>Objectives of the policy</strong></td>
</tr>
<tr>
<td>The objectives of this policy are to:</td>
</tr>
<tr>
<td>• Improve the efficient use of natural resources.</td>
</tr>
<tr>
<td>• Reduce pollution.</td>
</tr>
<tr>
<td>• Develop and implement measures for recycling.</td>
</tr>
<tr>
<td>• Educate and train staff and students to act responsible towards the environment.</td>
</tr>
<tr>
<td>• Networking and establishing partnerships with “green” companies.</td>
</tr>
<tr>
<td>• Develop innovative measures for the protection of the environment.</td>
</tr>
<tr>
<td>• Provide a framework for the setting and reviewing of environmental objectives.</td>
</tr>
<tr>
<td>• Create conditions that will allow the achievements of these objectives by means of continual monitoring, evaluation and improvement of existing policies, processes and procedures.</td>
</tr>
<tr>
<td>• Comply with the requirements of ISO 14001 and relevant legislation.</td>
</tr>
<tr>
<td>To achieve these objectives, the college will plan to:</td>
</tr>
<tr>
<td>• Improve communication between all sections of the College community (students and staff), in order to promote shared responsibility for the environment.</td>
</tr>
<tr>
<td>• Improve the quality of life on the campuses and head office through encouraging appropriate and considerate behaviour in relation to litter and anti-social behaviour.</td>
</tr>
<tr>
<td>• Train staff on sustainability issues and covering policy and practice in staff induction.</td>
</tr>
<tr>
<td>• Reduce water usage through wise use and implementing conservation measures.</td>
</tr>
<tr>
<td>• Minimise waste through reduced consumption, minimising waste and the adoption of efficient waste management and recycling methods.</td>
</tr>
<tr>
<td>• Develop targets for a reduction in energy use including the adoption of conservation measures and renewable energy sources.</td>
</tr>
<tr>
<td>• Adopting best practice in new build and refurbishment projects.</td>
</tr>
<tr>
<td>• A commitment to the wise choice of products and suppliers and using sustainable procurement processes.</td>
</tr>
<tr>
<td>• Adopting contingencies to reduce the environmental impact of transport/travel and to improve accessibility for all.</td>
</tr>
</tbody>
</table>

One of the first steps after the green team has been established and started working was to develop an environmental policy. This seemed to be necessary because there was passion and will to get the college as green as possible, but there was a lack of guiding documentation. The environmental policy should create a structure and a guiding document in line with the general Boland College’s vision and mission statement to effect proper implementation of the green initiative. The policy was developed by the Quality Management Office with input from the project manager and other members of the green team. In developing this document the team also received kind assistance from Blackburn College in the UK. The policy was signed by the Principal and is now available on the college intranet. “Developing this document was vital before the implementation of the green project”, said Mr Kabedi Mpopote, project manager for greening at Boland College. “The availability of such a document is very instrumental in ensuring a guided and more structured approach when such a
project is implemented. The document is endorsed by the Principal of the college therefore it comes with a lot of authority that somewhat binds the whole institution to abide by what is enshrined in it."

**Boland College: Training on ISO 14001**

In order to introduce concept and requirements of the ISO standard for environmental management systems and to make sure that at least the green team is knowledgeable of the standard training on ISO 14001:2004 was conducted on 3rd to 4th December 2013 at the head office. Additionally to the members of the green team some staff members from different campuses were included, because they were earmarked to play an important role when the project is rolled-out to their specific campuses. The knowledge gained from the training propelled the green team to pursue an official environmental audit. The latter has been commissioned and will be conducted in the second half of 2014.
5. Greening TVET institutions in Germany

5.1 Introduction

If TVET is given a key role in the context of green economy and sustainable development, then TVET institutions will be faced with extensive demands. It is at the micro level of training programmes that the principles and concepts of sustainability developed at the macro level of TVET would be manifested. Here, through practice, it would become evident which competences have to be promoted and trained among young people on initial training, but also among older people on further training level in order for them to be able to make professional contributions to societal transformation – or not. Sustainable development, environmental and resource protection would become the core focus of qualifying vocational schools. It would become much more than an add-on, temporary issues which are left to isolated committed teachers and trainers or which are only given attention on the periphery through individual projects. Even though the greening of TVET institutions has been discussed in Germany for more than 20 years already, there are hardly any TVET institutions which fulfil to any extent the criteria of the green TVET institution’s approach, as a total concept. However, there are numerous examples which do cover several aspects of the concept and can serve as role models.

In the following you will find examples of greening activities in German TVET institutions (vocational colleges and – in one case – a training company) in regard to the six key elements of the greening TVET institutions approach. Following this, two vocational colleges with special green profiles are introduced. This includes interviews with representatives of both colleges in which they explain their concepts, procedures and experiences.

5.2 Greening activities according to the five dimensions

Green campus:
Greening the campus systematically\(^21\)

The Johannes-Gutenberg-Schule (JGS) in Heidelberg is a vocational college with 100 teachers and 2,000 students. Its focus is on occupations in the crafts, industry and agricultural sector. Since 1998 the JGS is active in the fields of renewable energies and sustainable development by means of student’s projects. The college has implemented an environmental management system (EMS) and sees itself as a multiplier for eco-friendly and responsible behaviour. Within the framework of the EMS the vocational college assessed its environmental aspects and tries to minimize its environmental impacts systematically.

Among others the following objectives have been achieved:

\(^21\) Johannes-Gutenberg-Schule Heidelberg 2012
• **Waste:** The waste concept consists of two containers placed in the corridors. In addition there are crates for collecting paper. These were non-ambiguously labelled "paper", which considerably reduced the number of missed throws. There is a residual waste container in each classroom. Harmful waste produced in the college is collected in a special container. This also means disused fluorescent tubes, flat batteries and electronic scrap. The disposal is done by the municipality of Heidelberg and certified subcontractors.

• **Energy:** Students and teacher are periodically informed about the possibilities of saving energy. PC rooms have been subsequently equipped with key locks in order to further reduce the energy loss by standby-mode. Stickers and posters give information about energy saving opportunities. Ceiling-lamps in classrooms and workshops can be switched separately. A big PV system has been installed on the roof.

• **Paper:** In copier rooms, classrooms and the registry we have placed plastic containers to collect waste paper in order to separate clean waste paper for recycling. Digital media and both-sided copying using the downsizing-option should help to cut paper consumption.

• **Heat:** Common radiator-valves are being replaced by thermostats.

---

**Green curriculum:**

**Training in renewable energy technology**

New requirements in the fields of energy efficiency and the production of renewable energy have changed the core work patterns in, e.g. construction, metal, electric and sanitary, heating and air conditioning professions. A craft encompassing way of thinking and acting, and an adequately developed consulting competence are gaining importance more and more for the quality of craft work. In 2012, the vocational college of Osterholz-Scharmbeck introduced a one-year full-time vocational school for mechatronics focusing on “renewable energy technology” in order to meet these new demands. The full-time vocational school conveys expertise in handling renewable energy technologies to lower and middle secondary school graduates – skills that are demanded by local companies. Besides the elementary education in metal and electric technology they emphasize solar energy production (focus: photovoltaic and solar thermal). In addition to the practical and theoretical tuition the students run through at least one company training for several weeks in one of the local crafts companies. This training programme has been implemented successfully in the meantime. The first year could offer a most attractive programme in cooperation with regional and local energy suppliers, supported by regional craft companies, by the motivated work of the teaching staff and – not least – by the positive students’ acceptance:

- The existing photovoltaic installation on the roof of the school was expanded.
- The demonstration model „sun-tracking solar installation“ was developed and produced as a prototype.
- The cooperation partners gave lessons in class (lectures, thermographics in school) and facilitated excursions to renewable energy installations in the region.
- The students showed a strong learning interest and dealt with the significance of responsible and sustainable action at work.

---

The new full-time vocational school offers a technical elementary education as an approach into a dual vocational education in electric, metal and sanitary, heating and air conditioning technology professions. The project has been established well within the school and was continued in the subsequent school year. The strong number of applicants suggests a high acceptance among the student.

Green research:
Training for a sustainable regional energy supply

The BBS II [Vocational College II] of the City of Delmenhorst has set the objective to sensitize as many students as possible for the issue sustainability and to enable them to participate in the creation of society and the working environment with ecological, economic and social responsibility. Doing so, the students should take over responsibility as consumers and producers even-handedly. In the project the college’s already existing photovoltaic installation was expanded. This expansion was planned, implemented, documented and evaluated within the framework of a students’ project. Special attention was turned to the application of innovative thin-film-modules.

Learning situations were being developed in the course of the project comprising not only technical aspects but equally economical, ecological and social dimensions. Moreover the performance data of the photovoltaic installation were documented and published in the internet. This offers on the one hand an opportunity for all craft companies to observe a real installation and on the other hand interested vocational colleges can integrate the data into their teaching projects. The installation and its energy policy context is again a topic of the subject “solar energy” being offered within the political education for all classes in all types of education in the college. These newly developed learning situations were exemplified with apprentices of the electronics technicians’ career specializing in energy and building technology. In total 73 apprentices were involved. The solar installations were applied in the four years of apprenticeship focusing on different issues. The emphasis was in the learning field «Installation, launching and maintenance of energy installations» (third year of apprenticeship).

Training at the client’s order facilitates an open-structured and flexible processing of the task in the sense of complete action. Besides technical expertise a special attention is turned to methodological, social and personal competences. The co-design of relevant business- and work-processes as well as the society itself requires personal competences (decision-making abilities, assertiveness, self-motivation etc.) and social competences (teamwork capacity and conflict handling skills). Moreover technical competences (contents and expertise) and methods competences (research, presentation, conversation with clients, handling of planning software etc.) were strengthened.

Training for a sustainable regional energy supply includes the testing and evaluation of alternatives to the existing energy supply system in Germany, dominated by fossil and nuclear energy sources. For that purpose the students have carried out measurements and experiments, planned installations and calculated the anticipated output. Advantages and handicaps of technologies were recognized and assessed. The project contributes to the «Energy Transition» by conveying expertise to prospective specialists not only to install these technologies but also to assess them in terms of sustainability (covering the dimensions ecology, economy and social responsibility) and to give advice to clients. In excess of the production of renewable energy, the exploitation of raw materials, viz. rare earth metals, copper, and the

disposal of photovoltaic modules (PV recycling) are most important education issues. These were simultaneously taught in political education.

Green community:  
Apprentices take on sponsorship for a local creek\textsuperscript{24}

The Koehler Group, a family-run company, produces over 500,000 tons of specialized paper and cardboard annually and sells them all around the world. The company is well aware that its activities affect the environment. The effective use of natural raw materials, and the protection and management of the environment, are seen as prerequisites for the company and its staff for sustainable economic growth and the well-being of people and society. It is an inherent part of the company education to carry out at least one environmental protection project per year; including the creek sponsorship being actively practiced since 1997.

About 30 years ago creek called „Weidenbach“ was redirected in the course of a land consolidation project. The new bed of the creek was deepened in order to prevent flooding. Piles of rocks were used as bank reinforcements, which deprived the creek of any expansion possibility. Following plantations at the banks of the creek were patchy. Incited by the responsible regional administration, apprentices and employees of the company have taken care of a 1.4 km-section of the creek since 1997. They took the municipal surface waters development plan of the municipality of Oberkirch as a guideline. Every single action is - in advance - being coordinated with the local environmental organizations and the environmental representative of the municipality of Oberkirch.

Objectives of the creek sponsorship:
• Acceptance of responsibility;
• promotion of plant- and animal-diversity in and around the water, amongst others the resettlement of the river kingfisher;
• natural bank reinforcement by domestic woods in accordance with the location;
• reduction of the effort necessary for the maintenance of the watercourse;
• raising the awareness among apprentices and employees of possible consequences of water contamination.

Measures taken (inter alia):
• Groom woods and start new plantations;
• fight invasive plants;
• flatten too steep bank slopes;
• clean creek;
• produce, suspend, clean and maintain birdhouses;
• document and evaluate birdhouse occupancies;
• produce and install bridges;
• eliminate storm damages;
• remove obstacle for fish migration by constructing a fish pass;
• lead guided tours to pass on information.

\textsuperscript{24} See Koehler Paper Group 2014.
Green culture:
Future lab for the design of a patio

At the time of the described example the training centre of the Salzgitter Group, trained about 550 apprentices in eight technical and commercial vocations. The training management’s reflections about the redesign of the training centre’s patio formed the point of departure. As many apprentices as possible should be involved in the design- and the following reshaping procedures. A future lab should serve as a kick-off.

This future lab’s objective was to collect ideas for the prospected redesign of the patio and to sensitize the apprentices for the requirements of environmental protection. In addition, awareness for horticultural questions and subjects should be created among the participants and they should be motivated to participate actively in future construction- and plantation-projects by personal contributions. The future lab was held during four days involving 14 apprentices from commercial professions.

After a detailed address of welcome by the host and a round of introductions the future lab’s objectives and attributes were introduced. Moreover, its schedule was presented, as well as anticipated results and the final presentation procedure was drafted.

This was followed by an introduction by the host into the objectives and procedure of the phase of criticism. The participants formed four groups and discussed their opinions about the patio’s deficiencies and what should be improved in the first place. The points of criticism were documented on pin board cards. The individual participants presented their points of criticism and pinned the cards to a prepared board. On the board they were sorted according to their topics resulting into nine key aspects. The participants were led into the phase of imagination by means of a narration. Afterwards, divided in groups, they got the task to develop ideas as creative and fanciful as possible how the patio can best be incorporated into education without being affected by feasibility considerations. In the course of presentation and discussion of the imagination-phase’s results the key question emerged: What are the connecting factors for realization short-term, medium-term and in the long run? Then the participants assessed the projected visions and their individual aspects of apparent feasibility. In the phase of implementation the participants allocated themselves to selected visionary concepts for further development and work out feasible proposals for their implementation into training. Objectives, procedure and results of the future lab were finally presented to the instructors, the education manager and the company’s educational expert.

The following four project proposals were developed as a result of the future lab:

- Drawing: Relax in lounge corners within the green patio with additional basking-lawns for summertime;
- Model: Green patio with box tree lawn beets in „Rural Garden Style“;
- PowerPoint-Presentation: Clearly laid-out patio with self-made seating-elements from our own workshop;

- Computer graphics (by digital camera): Utilization of the entire space of the patio as a „sun lounge“ including sitting chair groups and potted plants arranged around the PPS logo.

The architectural proposals submitted by the apprentices were presented to the public on the occasion of an open house event in a partner school and afterwards for one month in the lobby of the education centre to the staff and the other apprentices where they drew much interest.

The future lab found so much approval to be a success so that further future labs for similar projects are scheduled.

Management integration:
Greening in the framework of an EMS²⁶

The Vocational College Neuss Weingartstraße is focused on economy and informatics. Roundabout 140 teachers teach 3,000 pupils in training courses within the dual training system (part-time) or in full-time vocational school courses. Since 1998 the college is focusing on environmental protection and education. Many different activities have been done to improve the environmental performance of the college and to integrate environmental issues into courses. Among others, an environmental management system (EMS) according to the European standard EMAS (Eco Management and Audit Scheme) has been developed and first validated in 2000. Since then the EMS has been re-validated every three years, and since 2006 the college is also certificated according to ISO 14001. Starting with the eco-audit process in 1998 the college has established an EMS and has upgraded ever since. The whole EMS, the build-up and process organisation, the protagonists and their tasks and responsibilities are described in detail in the environmental management manual. The constant improvement of environmental protection in school is the objective of the management system, which is under special attention of the active cooperation and inclusion of all persons involved in school. The environmental team as a central consulting board for all school-relevant environmental questions and activities is in the focus of the project. On the semi-annual conferences of the environmental team the members are being informed about recent projects and activities. The members submit their own contributions to environmental protection in college, and make decisions and discuss environmental matters. The environmental team is formed as shown in the graph on page 63).

The chairman of the environmental team is the environmental representative, supported by the environmental management team. They concertedly control the eco-audit process and the EMS. The environmental representative is supported by the representative for hazardous materials and the representative for safety, cooperating in terms of safety. The employees of the vocational college (janitor and secretaries) are being actively included in the work of the environmental representative, because they are significantly involved in environmentally relevant processes. The management representative safeguards the information flow to and from the principal’s staff. Moreover, he/she will further develop the environmental management system and promote environmental awareness on all levels of the school. The students form a crucial element in implementing the system. In the vocational college we offer two commercial vocational careers including specialization programmes for „environmental management“, in which the teaching is project-oriented and carried out in team-teaching. Students in these vocational education programmes work as entire classes or in teams participating in ecological focus-tasks and measures within the framework of the school environmental management.

²⁶ See Berufskolleg Neuss Weingartstraße 2009
5.3 Greening TVET institutions based on a holistic approach

Vocational and Technician College Butzbach

The college at a glance

The Vocational and Technician College Butzbach is located in a rural area approx. 50 km north of Frankfurt. There are 55 teachers responsible to educate roundabout 1000 students. 500 students are educated in the field of initial vocational education and training (full-time vocational school within the German dual training system as well as full-time vocational school) and vocational preparation. Vocational education and training courses are provided in the fields of automation & mechanical engineering, energy & environment, nutrition & catering trade, electrical engineering and media & design. Another 500 students are educated in the technician college (further education and training) to become a state-recognized technician in one of the following fields: food technology; mechanical engineering or conservation technology.

Since the mid-1990s the Vocational and Technician College Butzbach has set an emphasis on environmental protection, and the college is known nationwide for its competence in green technologies. Green issues are integrated into the school’s mission statement and vocational education and training courses as well as into the design of buildings and demonstrated on the school ground. There is also a close cooperation with local industry. On the one hand students of the assistance classes are partly trained in companies in terms of internships. On the other hand students of the technician college get real tasks for project work from companies and they present their results regularly to representatives of local industry.
Green issues in the mission statement

Extract from the school's ecological guiding principles:

- Our school is dedicated to the demands of Agenda 21. This is why raising ecological awareness is the main objective of our pedagogical work.
- Simultaneously the process of opening up the school to the outside is another crucial objective. By doing this the school is integrated into the social life of the region. The college communicates with its regional stakeholders and meets the demands of society including ecological issues, esp. in the field of energy.
- By working on projects - school-type and interdisciplinary teachings with ecological contents – the environmental awareness of teachers and students shall be promoted and individual autonomy shall be enhanced to a point that ecologically sensitive behaviour will shape actions in school life as well as social and private life.
- As a vocational school we take on responsibility for a qualified, future and market-oriented education and training. In future the pedagogical work shall be designed in a way that the development towards ecological thinking and behaviour is seen as a process and hereby is constantly being evaluated.
- The constant adaptation to the ecological requirements shall contribute to a sustainable development, required by the Agenda 21.
- It is most important for the teaching staff to consider themselves as role models, and that necessary skills will be acquired by modern, practice-oriented teaching.
- Our students shall be taught by not only developing a high environmental awareness and conflict-solving competence, but also feel firmly bound to the principles of humanity in order to show teamwork capacity.

Green issues in vocational education and training courses

A main focus area of the Vocational and Technician School Butzbach is renewable energy, energy efficiency and energy management. Among others these issues are an explicit topic of special training courses in the full-time vocational school as well as technician college.

On initial training level a two years full-time vocational school course on “Assistant on Solar Thermal and Photovoltaic” is provided. The class is for young people with intermediate school certificate and offers not only a vocational qualification, but also the entry qualification for entering university of applied sciences and arts. In the first year of learning the participants are educated in the school three days a week; the other two days they are trained in company within an internship. There is another four-week internship at the end of the first year of learning. In contrast the whole second year takes place at school. The students are educated in learning fields and learn how to install, start-up, repair and maintain solar thermal and photovoltaic systems as well as combined heat and power units.

In the technician college, students are educated to become state recognised technicians, e.g. for conservation technologies.

On initial training level a two years full-time vocational school course on “Assistant on Solar Thermal and Photovoltaic” is provided. The class is for young people with intermediate school certificate and offers not only a vocational qualification, but also the entry qualification for entering university of applied sciences and arts. In the first year of learning the participants are educated in the school three days a week; the other two days they are trained in company within an internship. There is another four-week internship at the end of the first year of learning. In contrast the whole second year takes place at school. The students are educated in learning fields and learn how to install, start-up, repair and maintain solar thermal and photovoltaic systems as well as combined heat and power units.

In the technician college, students are educated to become state recognised technicians, e.g. for conservation technologies.

The main topics are:
- energy saving / energy consulting;
- energy efficient heating and ventilation systems (e.g. heating technology, air-conditioning and ventilation technology, combined heat and power units, energy management); and
- renewable energies (photovoltaic, solar thermal, biomass, wind energy).

**Green issues in the buildings and on the school ground**

Many green technologies are visible on the school grounds and/or integrated into the buildings, e.g. PV, solar heating, solar cooling, wind energy, and usage of rain water. As a consequence of having developed courses on the topics, viz. renewable energies, energy efficiency and conservation technologies, the college planned and implemented the construction of an ecological-sound building with low energy consumption; which at the same time serves as an observation and experimentation object. The buildings are extendable. They are continuously being adapted to the current state of technology and serve as a place for the students to experiment and display models of changing green technologies. Results of the technician’s project works are used to demonstrate new green technologies in the school and to improve the school’s environmental performance. On the other hand these technologies are integrated into the training courses of assistants and technicians as learning objects.

**Technical features**

- One of the buildings achieves the national low energy standard.
- One building achieves the national ultra-low energy standard.
- The low-energy house is equipped with a green roof.
- Different wall constructions are showcased.
- Different insulation materials are showcased.
- A solar thermal cooling system designed and installed by technicians.
- Different types of wind power plants on the school ground.
- Different types of PV systems are installed.
- Different types of SWH systems provide hot water.
- A big display shows the results of the PV and SWH systems.
- High efficient heating systems are demonstrated.
- An electric car demonstrates an alternative to conventional cars.
Interview with Mr Jens Voss, Head of Environment and Energy Department of Vocational and Technician College Butzbach

Mr Voss, the Vocational and Technician College Butzbach provides a range of vocational education and training programmes in the field of renewable energies and energy efficiency. What can students learn in these courses?

We have to distinguish between two courses: On the one hand, we have the so called „assistant occupations“ in the full-time vocational school and we have technician courses on further education level. The full-time vocational school is about the basics of the installation of renewable energy systems. The participants learn how to install, maintain and launch these systems including all technical and theoretical backgrounds involved with it. The technician training is more diversified. Part of it is planning and configuration of technical installations that are affected by renewable energy, ventilation, air-conditioning and heating. Moreover, an important learning content within the technician’s training is the cooperation of these various technologies as well as the integration of renewable energies in already existing energy supply systems.

Which opportunities do the graduates of your courses have on the labour market?

In general their chances are excellent, but we have to differentiate again. The assistant’s career in most cases is a first step into occupational life for very young people; many of them continue with an additional vocational training or go to university. This is why the chances on the labour market are difficult to estimate. The graduates in fact do have fair chances and many of them have found employment in companies for heating systems and electric installations. For the graduates of the technician courses the opportunities are excellent, depending in fact on which prior education the candidate had. Somebody coming from the specialization as installation mechanic has very, very good chances to find employment as a technician in the fields of renewable energies or heating technology. On the other hand, somebody having a less attuned pre-education, e.g. having worked before in environmental technology or sewage technology, may encounter some difficulties in finding an immediate employment.

How do you cooperate with the local economy?

The education for an assistant’s career always comprises internships in companies. Therefore we have strong connections to companies, because we constantly look for places for internships, which are in fact offered to us. The contact during the technician’s training is mainly kept via the project work. Every student has to prepare a project work in the course of the training and at this point we cooperate with companies from the region intensively.

One essential feature of your school is the fact that you exploit the building itself and the existing technology as leading objects. Moreover you offer the students the opportunity to find their own technical solutions and to install and test them in and on the building and school premises. Would you please illustrate that?

We have here, for example, a passive house that was launched about three years ago. A passive house should consume less than 15 kWh per m² and year. We have set-up a student group now on the following project task: Check if the passive house parameters are being kept to. Is the actual energy consumption really as low as required? If not, why not and what can we do about it? How can we manage to keep...
the actual energy consumption under 15 kWh per m² and year? Now the students have to come up with concepts to improve the efficiency of the ventilation. This is one of the possibilities how students can work directly on the building.

Are the students' proposals always directly implemented in the college?

The proposals developed by the students are implemented as far as possible. Sometimes this will take a while, because we cannot just restructure a building; the authorities still have a say in that. Up to a certain dimension we can do it directly.

How is that received by the students?

The students like it as long as it keeps moving and there is progress.

This demands a lot of flexibility from the teachers. What's their attitude?

Flexibility among the teachers is not much of a problem. For teachers, it is more difficult to schedule the project work, because in this building there are also classes being held at the same time. On the other hand, the students working on projects need sufficient mentoring time, and the teachers’ mentoring time must also fit into this schedule. A very careful organization is needed to provide the teachers with the necessary time and presence. From this point of view – I agree – that requires flexibility. Three, four or five colleagues are willing to fulfill this tasks and normally that's sufficient to supervise the projects.

Everything that can be seen in your college today didn't fall out of the sky but has grown over a long period of time. What were and still are your most important factors that have enabled this success?

The key factor was our former deputy director. Twenty years ago, he already had a vision, about what vocational education should be and which focus could suit the college. He was also very active in politics and a member of many political boards and bodies. Moreover, he was an outstanding organizational talent being able to bring together various spheres and exploit them for the college. He found ways to acquire the financial means that were necessary to achieve this. The next factor was the former deputy director's ability to find colleagues, who were enthusiastic with this issue and invested much additional energy into this project to bring it on the road.

Vocational College for Construction Occupations of the Hannover Region

The college at a glance

The Vocational College for Construction Occupations of the Hannover Region provides vocational education and training courses in regard to all occupations in the field of civil construction, from bricklayers to roofers, and from painters to carpenters. Roundabout 110 teachers and 15 administrators take care of 2500 students in education and training courses in regard to 29 occupations within the German dual training system. Students not having a contract with a training-company are
provided a vocational orientation in construction technology, wood technology and supply engineering in terms of full-time vocational school classes.

**Green issues in the mission statement**

Extract from the school’s mission statement:

**Our vision**

- The Vocational College for Construction Occupations of the Hannover Region aims at the utmost possible satisfaction among all stakeholders as client-oriented provider of vocational education training.

**Our mission**

- The Vocational College for Construction Occupations of the Hannover Region prepares its graduates for the working life by conveying a holistic vocational core competence and developing with them an orientation in the world of living.
- In cooperation with its partners it qualifies its students in becoming skilled for higher education courses.

**Our promises**

- In our school we create a living and working habitat in which they can optimize their personal and technical development.
- We offer companies the best educational support in regard to human resources development and technical qualification of staff.
- We qualify our students in a concise and optimal manner in order to meet the requirements of higher education institutes.
- The college offers a working atmosphere that is characterized by reliability, tolerance and open-mindedness, where everybody fulfills his/her respective tasks autonomously. The staff is offered work possibilities appropriate to individual qualification profiles as well as support in further development of talents.
- To its students the school conveys the basic qualifications necessary to participate in social life and to take on responsibility for sustainable development.

**Centre for Energy Efficient Civil Engineering & Building Technology**

Together with the neighbouring school the Vocational College for Construction Occupations of the Hannover Region operates the Centre for Energy Efficient Civil Engineering & Building Technology. The development of the centre has been sponsored by the Federal State of Lower Saxony and the authority of Hannover region. In modern vocational education and training, topics like climate protection, energy efficiency, sustainability and resources conservation are in focus of various practical solutions. Apprentices in installation occupations in the fields of metal and electric engineering as well as in civil construction occupations execute educational projects covering topics like thermal insulation, smart facility systems, alternative heating systems, controlled ventilation, ecological balances of products, recycling of construction waste, healthy construction materials and barrier-free living. The sensitization for energy efficiency and the handling of innovative technology become an integral component of students’ vocational competence. Common reference is the construction, operation, maintenance and repair of energy efficient
facilities. They are considered as a system, where various trades contribute their specific skills and knowledge. Seeing the bigger picture is hereby essential. The friction losses in collaboration of different trades are overcome. The overall objective is environmentally compatible construction in cooperation with others.

In the classrooms the students are being exposed to typical everyday situations, for which they have to develop solutions. Experiments and measurements are being performed in the laboratories for electric, control technology and for supply engineering. In three pavilions the learners can see, touch, test and analyse different construction standards. Various parameters (e.g. outside temperature) can be simulated and their impact can be quantified.

**Technical features**

- 27 different wall constructions are showcased.
- Three different floor constructions with or without thermal insulation.
- Three platform roof varieties.
- Windows with different u-values, with or without assembly failures.
- Each pavilion equipped with Blower-Door-Test-device for air-tightness.
- Two infrared cameras for demonstration of thermal bridges etc.
- Different kinds of PV and SWH systems as well as heat-pumps.
- Comparison of the heating energy balances of the three pavilions.
- Surveillance of doors and windows.
- Building services engineering with KNX / EIB.
- Lighting booths with measurement of rates of reflections.
- Demonstration of energy balances of different lightings.

In three pavilions the learners can see, touch, test and analyse different construction standards.
Interview with Mr Ulrich Erdmann, Principal of Vocational College for Construction Occupations of Hannover Region

Mr Erdmann, at your college you have established a Centre for Energy Efficient Civil Engineering & Building Technology. What’s it all about?

There are several issues at the core of our centre. Very important is energy efficiency. In construction industry the emphasis of clients’ orders has shifted from construction of new buildings to the modernization of old buildings under special consideration of energy efficiency. Energy efficiency means that the consumption of heating energy will be reduced, and ventilation, hot water consumption will be optimized. Another typical issue is the constructional improvement of the insulation of the walls of a building. We are also aware that roofs must be insulated, windows must be modernized and heating systems must be equipped with a heat pump or condensing boiler. Legal parameters lead to more complicated and complex technical requirements.

The building is no longer considered as a line-up of individual crafts, but is considered as an integral system. This is a fundamentally new point of view. All individual measures have to subordinate themselves to this system ‘building’. As long as the craftspeople have worked side by side with each other parallel or one after the other consecutively. From now on they have to communicate and coordinate in order to cooperate. We replace coexistence by cooperation. Let me give you an example: There are carpenters who construct roofs; and these roofs are manufactured in an airtight manner in order to keep the warmth inside the house. For this purpose airtight layers are being installed. These layers are being glued together to make the roof airtight. But now the electrician turns up saying: „I have to install the satellite dish.“ By connecting the dish on the roof, he pierces the airtight layer and destroys it. This means of course that there will be constructional damages on the long run. This simple example shows the importance of cooperation between the individual crafts.

Another topic is the protection of resources. The construction industry is one of the most resources intensive economic sectors. In our college we regard all construction materials which we process under a different point of view: We first assess their individual insulation performance. Besides that, we have an eye on the energy that is necessary for the production of the material until its application on the building site, and – later – if it can be reused or recycled or if it can be disposed properly. Besides the teaching of technical contents, our teachers also face the challenge to create awareness among the students that resources and energy are finite, and thus need to be consumed efficiently. Teachers and students must be sensitized that our global resources are limited and that we have to handle them with responsibility and respect for further generations.

Which role does the centre play for the profile of your college?

It plays a role in regard of two aspects. First the internal aspect: We are the centre of competence for construction technology in the region of Hannover. Here we have 2500 students being educated in a big variety of crafts. We are aware of the fact that the quality of our vocational education will essentially determine the awareness and the professional performance of the next generation. And this responsibility we want to accept. We all agree on that point. We’ll face that. The idea of sustainability becomes more and more the brand mark of our school. This is well accepted by the teaching staff. The Centre for Energy Efficient Construction & Building Technology with its pavilions, laboratories and facilities is the outside appearance, what you can see, so to say. The inside central element is formed by the curricular work. This means that we elaborate our learning situations. Learning situations describe
complex, life-like tasks within the individual crafts. They are summarized in about 60 to 80 lessons and will convey strategies to the students that will enable them to fulfill their future occupational tasks adequately. The design of these learning situations in full consideration of the idea of sustainability – this is our school’s specific knowhow. We have a clientele disposing of various degrees of abstraction abilities. This is why we do not only have to consider carefully „what“ we teach, but also „how“ we do it. We have to offer various levels of abstraction. We also have to offer our students different representation systems. They must be able to physically touch and see the learning objects and comprehend the contents by using charts. We achieve that by our special methods – the learning situations. The students find here the opportunity to elaborate their ideas. They also have the chance to cooperate with other crafts and to exchange experiences with them.

Now to the exterior aspect: A college is never an isolated entity, but is imbedded in a network of outside partners. Here we have to name the training companies in the first place, followed by the chamber of crafts and the chamber of industry and commerce. We have to communicate with them; and this we do, and we want to use this chance to make this Centre for Energy Efficient Civil Engineering & Building Technology competent and attractive for the market.

In which way were your teachers involved in the process of planning and implementing the centre?

Principally, such a project cannot be realized by any means without the intensive involvement of the teachers. That’s impossible. The teachers on the one side are the technical experts in their crafts and have their subject-related expertise. Later on the same teachers have to deal and work with it, day by day. The initial idea for this centre came directly from our college. The colleagues involved in the development of the centre started by forming a planning group. They made up a concept first and conceptually designed the laboratories, pavilions and the learning contents. Continuously the constructional concepts had to be synchronized with the developed didactical concepts and adapted adequately. The procurement processes of all installations, equipments and the pavilions, the performance description, the financing and the communication with the other TVET stakeholders were within the responsibility of the school management. The construction phase of this centre was observed by the teaching staff. When everything was ready and handed over, an almost unchanged working group continued with the maintaining tasks. Now they are about to try to implement the whole thing into the teaching process: They assess the demand for further training and which equipment items still have to be purchased; they take care of a proper maintenance of all installations and participate in initiatives on federal state and nationwide levels. All the experiences we made show one result: A successful and sustainable support in favour of such initiatives requires a maximum creative elbow-room for the teachers and a full support by the senior management of the school.

How shall the centre be integrated into everyday teaching?

The responsible person is always the head of an individual technical department. All heads of technical departments are at the same time members of this working group. This working group elaborates the specific standards for the learning situations. In addition, the group determines the evaluation criteria for the teaching quality and the methodological procedure. All this is done by the working group. Moreover, they cohere with other subjects like German language or politics – especially related to the term sustainability. The challenge of integration is tackled in two steps. In a first step, we check all learning situations in all courses of all crafts up to which extent they reflect energy efficiency, saving resources and sustainability. These learning situations must then be adapted or sometimes even newly phrased, because colleagues might come up with fresh ideas or new requirements have
emerged. After this revision process we have to test them. We best exercise this at a project day. At this project day these learning situations will be tested with real groups of students. The students will enter the pavilions and laboratories and start working there. In the end, we’ll evaluate and analyse if we have reached the aspiration level, if the representation systems were adequate, if our methodology was suitable and if we actually have conveyed the learning contents that we wanted to be conveyed. Then we meet again with the whole working group, evaluate and cluster the whole thing and deduce further measures from here.

This second step means that we want to work interdisciplinary between the different crafts, with the intention that various crafts have to cooperate. But now we face another problem: Maybe the bricklayers have vocational school classes on Mondays, the suppliers on Wednesdays and the electricians on Fridays. This means that the students normally do not meet at school. So we have looked for a solution, how these students can cooperate. On the internet, we have an interactive learning platform, and this platform will be used by teachers and students as a workbench with wikis and glossaries. Students can work at a document together simultaneously: prepare a presentation or similar things. We can summarize it as such: The integration should proceed in a well-planned form including many feedback-loops within the teaching staff, including further training of teachers in order to make them feel secure in their technical expertise, and with a lot of support from the school management.

Other schools might have the idea to build up a similar centre. What advice would you give to interested colleagues? What should be considered to make it a success?

It would be perfect, of course, if the ideas came directly from the teaching staff. Anyhow, it must be an intensive in-house process of discussions and exchange. Right from the planning phase on, you have to be aware that the operation of such a centre consumes resources. There are financial resources in the first place, because it ties up money that is no longer available for other purposes. A second resource, which schools have, are the so-called mandatory teaching hours: What I give as an input here, I have to take away elsewhere. Both issues will unavoidably lead to an in-house distribution conflict! It is most important to clearly communicate the objectives, which guide you, and to tell transparently, what the resources will be used for. It has to be communicated with the teaching staff how the whole affair will be integrated into the classroom-work and interim achievements have to be celebrated as successes.

Second to that is the necessity to keep up a constant cooperation with the financial authorities. Of course, they also need a certain time frame – that’s why they have to be embedded at an early stage of the process, and then again and again to be involved at crucial phases. Moreover, the synchronization with the extracurricular authorities is very important: These are e.g. the School Authority or the Ministry of Cultural Affairs.

Last but not least, the establishment of such a centre is no day-to-day activity, it is additional, it’s on top. What do the school management and the teaching staffs really need to pull through such an object? They need stamina; they need perseverance, and the will for endurance. They need clarity of objectives, clarity of decisions and a constant process of discussions and exchange with the teaching staff. And what you need most importantly is enthusiastic teachers.
Bibliography


GIZ; 2009: Ecological Sustainability in TVET. Planning aid to initiate and implement environmentally relevant topics in selected programmes and offers of the development cooperation. Online: http://www.giz.de/akademie/de/downloads/Lehrbrief_21_-_Ecological_Sustainability_in_TVET.pdf [accessed: 12-3-2014]


Further internet sources


# Photo Credits

<table>
<thead>
<tr>
<th>Page</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>19</td>
<td>Karin Tavernier (2x)</td>
</tr>
<tr>
<td>21</td>
<td>Karin Tavernier</td>
</tr>
<tr>
<td>22</td>
<td>Klaus-Dieter Mertineit</td>
</tr>
<tr>
<td>23</td>
<td>Klaus-Dieter Mertineit</td>
</tr>
<tr>
<td>24</td>
<td>GIZ; Klaus-Dieter Mertineit</td>
</tr>
<tr>
<td>25</td>
<td>GIZ</td>
</tr>
<tr>
<td>26</td>
<td>GIZ (2x)</td>
</tr>
<tr>
<td>28</td>
<td>George Nelson Chase</td>
</tr>
<tr>
<td>29</td>
<td>Martin Schnauss / Katie Brown; Dieter Lamm</td>
</tr>
<tr>
<td>30</td>
<td>Azcolvin429 and NASA (Creative-Commons)</td>
</tr>
<tr>
<td>31</td>
<td>Agentur für Erneuerbare Energien</td>
</tr>
<tr>
<td>32</td>
<td>Agentur für Erneuerbare Energien</td>
</tr>
<tr>
<td>33</td>
<td>ABB</td>
</tr>
<tr>
<td>39</td>
<td>Boland College</td>
</tr>
<tr>
<td>46</td>
<td>Boland College (2x)</td>
</tr>
<tr>
<td>47</td>
<td>Boland College (3x); Eastcape Midlands College</td>
</tr>
<tr>
<td>48</td>
<td>Northlink College; Port Elizabeth College; Eastcape Midlands College</td>
</tr>
<tr>
<td>49</td>
<td>Northlink College</td>
</tr>
<tr>
<td>50</td>
<td>Port Elizabeth College (2x); Umfolozi College</td>
</tr>
<tr>
<td>51</td>
<td>Eastcape Midlands College; Northlink College (2x)</td>
</tr>
<tr>
<td>52</td>
<td>Central Johannesburg College; Eastcape Midlands College</td>
</tr>
<tr>
<td>53</td>
<td>Boland College</td>
</tr>
<tr>
<td>54</td>
<td>Boland College</td>
</tr>
<tr>
<td>56</td>
<td>Boland College</td>
</tr>
<tr>
<td>57</td>
<td>Klaus-Dieter Mertineit</td>
</tr>
<tr>
<td>58</td>
<td>Daniel Kunstmann</td>
</tr>
<tr>
<td>60</td>
<td>Koehler Group</td>
</tr>
<tr>
<td>61</td>
<td>Reinhard Voges</td>
</tr>
<tr>
<td>63</td>
<td>BSB Butzbach</td>
</tr>
<tr>
<td>65</td>
<td>BSB Butzbach</td>
</tr>
<tr>
<td>67</td>
<td>Klaus-Dieter Mertineit</td>
</tr>
<tr>
<td>68</td>
<td>BBS 3 of Hannover region</td>
</tr>
<tr>
<td>69</td>
<td>BBS 3 of Hannover region</td>
</tr>
<tr>
<td>70</td>
<td>Klaus-Dieter Mertineit</td>
</tr>
</tbody>
</table>
Imprint

Published by
Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

Registered offices
Bonn and Eschborn, Germany

Human Capacity Development (HCD) for Technical and Vocational Education and Training
Academy for International Cooperation
Käthe-Kollwitz-Str. 15
D-68169 Mannheim
Germany
T +49 621 3002-0
F +49 621 3002-132
tvet@giz.de
www.giz.de

As at
May 2015

Design
Institut für nachhaltige Berufsbildung & Management-Services GmbH

Photo credits
BSB Butzbach: front page
(for further references see annex)

Text and editing
Dr. Klaus-Dieter Mertineit
Martina Müller-Norouzi (GIZ)
Laura Roser (GIZ)
GIZ is responsible for the content of this publication. However, the opinions and analyses expressed in this manual do not necessarily reflect the views and official policies of GIZ.

On behalf of
Federal Ministry for Economic Cooperation and Development (BMZ)