



**GT VET
Greening Technical VET
Sustainable Training Module for the European Steel Industry**

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**Industry Driven Analysis of Job Requirements
and VET Systems**

Summary Report of Work Package 2 and 3

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Industry Driven Analysis of Job Requirements and VET System Reflection



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Greening Technical VET

Sustainable Training Module for the European Steel Industry

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1. Introduction

In summarising the results of the steel industry job requirements on green skills, and its reflection in the vocational education and training (VET) systems, is to underline steel's indispensability and argue that it remains the industrial backbone of the post-modern society: Steel, with its mechanical properties and ability to be 100%recycleable, was, is and will continue to be the most important structural substance in the world.

This background report summarises the results of the Industry Driven Analysis of Job Requirements (work package 2) and the Analysis of VET Systems Reflecting Anticipated Future Requirements (work package 3) of the European project GT VET: Greening Technical Vocational Education and Training – Sustainable Training Module for the European Steel Industry. Both analyses build the ground for the development of a European training module for greening technical VET in two blue collar occupations in the steel industry: industrial mechanics and electrical technicians. These two occupations are broadly used in metallurgical plants (according to the International Labour Organization classification of occupations – doc. ISCO-08 Draft definitions; 9 July 2009), and employed on posts in three crucial departments: blast furnace, steelmaking shop and hot rolled mills.

General information about the project and the training module as well as additional reports and information concerning this report of work package 2 and 3 could be found at the GT VET website: www.gt-vet.com.

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2. Industry Driven Analysis of Job Requirements

The aim of the ‘Greening Technical Vocational and Educational Training – Sustainable Training Module for the European Steel Industry’ (GT-VET) project is to create a training module for the European steel industry, which promotes skilled workers’ “green skills” qualifications regarding environmental, climate and safety at work issues and develops these competences through vocational and educational training or further training. The project is realised by a consortium of steel companies and research institutes in four European countries as well as by European social partners’ organisations of the steel industry.

The first stage was an Industry Driven Analysis of Job Requirements (GT VET work package 2), which researched relevant national laws as well as company-specific regulations of ‘green’ industry driven job requirements. The full report of this analysis (accessible under www.gt-vet.com) summarises all important laws and regulations concerning environmental, climate and work protection. Next, the company guidelines and any identified business needs were further researched in workshops and interviews with business/industry professionals in the fields of climate and environmental protection, occupational safety and education and training. These workshops with the participating companies were also conducted in order to discuss and describe industry driven job requirements with regard to “green skills” referring to knowledge, abilities, values and attitudes of skilled workers (industrial mechanics and electrical technicians as the two main occupations, including varieties in the participating countries). Concrete ideas and requirements for a training module have been formulated by all partners responding to prospective (vocational) training demands of the steel industry concerning environment, climate and occupational safety. The industry driven analysis shows the ambition to learn as much as possible about necessary green skills and the corresponding learning content for skilled workers from an industrial perspective.

2.1 European, national and company related legislation and directives

This chapter summarises the analysis of European, national and company related legislation and directives on environmental and health and safety issues, mentioned in the extended report.

Environmental legislation on the European level is developed through the relevant directives and for the purposes of this project structured on categories of environmental threats: waste and

emissions to atmosphere and water. The following named directives can be looked up in the full report available under www.gt-vet.com.

Waste

The mechanical technician's influence is limited to handling waste that results from maintenance and the repair of machines and mechanical installations. It refers mainly to oils. Mechanical technicians, among others employees, should pay special attention to hazardous waste. The *Waste Framework Directive* does not have an influence on a daily work of electrical technicians.

From the *Landfill Directive* one might conclude that waste generated in the range of activity of electrical and mechanical technicians needs to be properly classified and this dictates where waste may be landfilled.

The *WEEE (waste electrical and electronic equipment) and Packaging Directives* greatly affect mechanical and electrical technicians in their day to day duties and how they consign waste packaging (both electrical and mechanical technicians) and electrical / electronic equipment (only electrical technicians) to meet the internal requirements of their company regulations and legislation. All their obligations in that area should be described in individual job descriptions for work-places where mechanical technicians are employed.

Emissions to Atmosphere

Technicians (both mechanical and electrical) should be aware of the requirements of the permit (based on *integrated pollution prevention and control IPPC Directive*) to ensure that no uncontrolled releases occur (e.g. during maintenance activities). The mechanical technicians should apply the best available techniques (BAT) accepted for their work-places.

Based on *Pure Air for Europe Directive* technicians (both mechanical and electrical) should be aware of the regulation of the legislation to ensure no uncontrolled emissions occur (e.g. during maintenance activities).

Emissions to Water

Technicians (both mechanical and electrical) have the potential to cause the uncontrolled release of contaminants to controlled waters through maintenance activities (replacement of fluids such

as coolants/oils, etc., blow down of cooling towers, chemical storage, etc.) or through the setup of control instrumentation and monitoring systems.

Health and safety legislation on the European level is developed on the level of directives. The legislation in this range is of rather a general character. It describes different threats and risks (e.g. dangerous agents at work, chemical agents, noise, vibrations, and artificial optical radiation). From the point of view of analysed Directives mechanical and electrical technicians are exposed to the same threats and risks while performing their duties (maintenance and repairs) like other employees in the company.

The European environmental and health and safety law is completely implemented into national law in partner countries to this project. In some countries additional legal documents were implemented within legal systems (e.g. Poland in the range of law on health and safety – the main obligatory legal document is the labour code, and for steel sector the decree on health and safety in iron and steel metallurgy).

Company Directives

The companies' directives (i.e. steel companies involved in this project) are in line with national and European legislation and reflect specific needs of steel companies. It is developed in different forms depending of management systems of these companies. For example in Tata Steel there are strategies (e.g. Air Quality Strategy Group) and policies (e.g. Environmental Policy), in ThyssenKrupp Steel it is organized in guidelines (e.g. "environmental protection is an overriding aim of the corporate policy") and in ArcelorMittal Poland books, policies, operating procedures, plans and directives of the General Director (e.g. Procedure PS/US/S.21 Identification, assessment and supervision over environmental aspects) exist. In each considered company Environmental Management System (EMS) guarantees the implementation of the environmental policies, rules, strategies and legislation.

Impacts of Environmental Legislation for the Steel Industry

The development of the sector and vision of it in the future is strongly linked to external conditions, where political ambitions play a crucial role. The second factor is international competitiveness. The increasing demand for steel products inspires engineers to innovate technological routes to produce more, better and cheaper products than competitors. The world-wide trend to-

wards sustainable development and a low carbon economy overlaps with regular technological progress and challenging environmental legislation.

The European Union is the world leader in promoting environmental sustainability. Environmental legislation is aiming to minimize the effects of the industry on the natural environment. For the iron and steel industry it means more costs – not only in devices to mitigate pollution, but much more significantly in innovative technologies. Thus, steel producers may be less competitive when competing with those that do not have to obey such restrictive environmental laws. The serious threat is of “carbon leakage” i.e. the transfer of production to geographical regions without limitation of CO₂ emissions. In that case the threat of lost jobs, among them mechanical and electrical technicians, might occur. The history of the EU emission trading system (ETS) and present situation do not indicate that this scenario would become real in the short-term, but the threat still exists. Some other measures to reduce greenhouse gas emissions, such as the EU-ETS, were proposed by EUROFER as Baseline and Credit system.

The European steel industry has the most modern and efficient facilities. Emissions from existing metallurgical technologies have almost reached their minimum, and there is little room for further improvement without new process technologies.

Almost all research and development metallurgical centres are working on breakthrough technologies, which could minimise the effects of the industry on the natural environment, as well as decrease energy use and cut production costs. There are three fields of concentration:

1. Staying close to the carbon-based blast furnace technology and develop methods to decrease CO₂ emissions and find effective ways to capture and storage CO₂.
2. Replace carbon with other reducing agents and fuels such as natural gas, hydrogen or electricity.
3. Using a biomass which contains “short-cycle” carbon.

The best example of the first solution is the steel industry based project ULCOS. For the steel sector, the public-private-partnership under the umbrella of the Ultra-Low CO₂ Steel (ULCOS) project is leading to some very promising technological innovations. The most advanced and promising technology is the Hisarna coke free steelmaking process, which will be able to reduce greenhouse gas emissions from steel production by 80% (in combination with Carbon Capture and Storage (CCS) and 20% without CCS) when compared to the current steel plant. This tech-

nology is expected to reach market maturity around 2025. Both the capital investment and operational costs of this type of steel production look promising.

2.2 The Perspective of the Companies

Based on the initial document analysis the identification of industry needs on green skills for future skilled workers (mechanical and electrical technicians) was made through structured interviews or workshops with relevant employees of the steel companies (managers, trainers, apprentices). The interviews/workshops focused on:

1. Environmental Legislation and Company Implementation
2. Skills, qualifications and occupations (Electrical and Mechanical Technicians)
3. Core elements of a 'training module' for the steel industry.

2.2.1 Germany: ThyssenKruppSteel Europe (TKSE) Training Centre in Duisburg

In Germany a workshop was conducted using group discussions with different employees: managers of the training, health and safety and environment department, trainers and apprentices (mechanical and electrical technicians).

2.2.1.1 Environmental Legislation and Company Implementation

Concerning environmental protection issues, a central contact point is located on parent company level. The parent company also maintains corresponding offices in Brussels. Additionally, there are links to associations (EUROFER, World Steel Association) covering topics such as environmental and climate protection across sectors. At the company level contacts to national authorities are considered important because these are implementing legislation and carry out company inspections. In addition, the company is constantly in contact with the plant operators to discuss environment-related decisions and to keep the Board constantly informed (including the case of larger investments). At organisational level important changes are displayed in the work instructions.

Important Legislation

For the Department of Environment and Climate Change as well as for the engineers, especially CO₂, it is an important legislative issue that involves lobbying efforts and for which legislation is continually updated. It might be that this dynamic leads to a situation where the engineers of the company are inadequately prepared for their prospective management tasks by the universities. The TEHG Amendment (Greenhouse Gas Emission Trading Act) constitutes an important law through which an energy management system will be established. In this context the EEG (Renewable Energy Sources Act) is relevant. For the division of hazardous substances the program REACH (EU directive: **R**egistration, **E**valuation, **A**uthorisation and Restriction of **C**hemicals) and the Compliance Program (CLP) are important, especially for the hazardous material labelling and work safety.

Another important area, especially in education, is the issue of hazardous substances (storage, recycling and substitutes). Therefore, important laws have to be “translated” into practical instructions. The high pace of hazardous substances definition and re-definition also requires a permanent operational adaptation. In vocational education the ordinance of disposal rules (e.g. container and waste management, prevention of fires) as well as the handling of hazardous materials is important. Currently a comprehensive ‘white education’, that means without contact to hazardous substances is available only to a minor extent.

The company implementation - Obligations and guidelines of TKSE

The *Environmental Management Handbook* is the key instrument to communicate objectives and regulations of the company concerning environmental protection. It contains all requirements and principles decided upon by the management board, described in practical and applicable guidelines to make it understandable for the whole workforce. The higher the corporate level, the more theoretical is the reference to the Handbook.

The *Occupational Safety Handbook* contains the essential corporate guidelines and all the institutions, programs and processes that are involved in occupational safety. For further development of the handbook, a risk assessment of every workplace is supplied, including corresponding health and safety measures in a very complex procedure. Finally, the staff receives a set of behavioural related core rules and procedures only for its operating areas. In training sessions the

employees are regularly instructed concerning these measures. This risk assessment and instruction is required by law; the design of the training is left to the company.

With regard to environmental standards the company moves simultaneously between exercising their duties ('working rules off') and individual initiative to go beyond what is legally necessary. On the one hand, the company has to enforce the regulations. On the other hand, internal processes have to be analysed continuously to improve performance independently from legal requirements. A focus was set i.e. on the issue of resource efficiency through an in-depth analysis of the process flow. In this area seminars have been offered to the workforce. On the operational level an internal or external benchmarking (among companies) is considered important (amount of energy consumption and steel production).

Although the legislature does not require accident-free operations TKSE has set the guideline 'zero accidents' and focuses 'behavioural occupational safety'. In this context the internal 'ADAM program' ("safety through attentive workers") was developed on the premise that 'everyone takes responsibility for everyone' in order to avoid misconduct. Without these extensive guidelines TKSE would not be competitive because this policy is an international 'State of the Art'.

Targets on environmental protection

Targets concerning environmental protection are collected annually from every division. Approximately 150 targets are set per year and divided into five to six categories (e.g. energy saving). For the year 2009/2010 there were about 146 measures and about 88 (60%) were completed (result of the monitoring). In turn, individual goals (e.g. reduction of emissions), the corresponding action (installation of a water spray) and the required investment are derived from this point. The compliance rate of TKSE in general is 60% and only less than 5% are stopped completely (e.g. not conducive anymore; changing targets; target is identified as unreachable). The remaining measures will be transferred to subsequent years.

The companies define 'its contribution to environmental protection' on their own initiative and have no guidelines imposed from the management level. Only if a company formulates no targets the management will take measures. Then, the figures for environmental protection (operation phase; data from measuring devices, e.g. emissions) will be awarded. Although TKSE is 'at the top' of the competition in environmental protection, it is not the only company worldwide that takes into account environmental issues. It is exposed to a greater competitive pressure and re-

lies more on the initiative of the departments to implement various internal company guidelines. In the context of occupational safety, 'reactive targets' like accident rates are the centre of attention. These are also relevant for bonus payments.

Trainees and work instructions

The info-point project has recently been implemented in order to provide the trainees with information on health and safety lines (mind map), a safety manual, and facts about environmental protection, documentation and information about accidents and responsibilities of various persons in the company. The info-point is a clearly visible element of the everyday workplace and therefore easily accessible. This is supposed to encourage everyday learning and interest of the trainees. The project was launched by the personnel department together with the trainees two years ago. According to the workshop participants, it reflects massive changes in the educational approach in the German dual training which started with the new design of the technical training occupations in 2003. The key phrase 'holistic' or "integrated" training refers to the 'business or process orientated provision of training content'.

Cooperation of departments

If a department has a concrete problem (e.g. hazardous substances) and is not able to find a solution on its own, the occupational health and safety department (OHS) will be contacted. Together with a working group the problem is discussed on the basis of operational instructions and procedures. The OHS contacts the responsible hazardous substance officer to further discuss solutions. This happens several times a year. On top of this there is regular communication between the officer and the hazardous substance department. There is also a working group composed of the hazardous substance division, the hazardous substance officer and the company medical officers. Since the beginning of 2011 the working group 'safety at work' is part of the education and training centre Duisburg. Once a month the security officers meet (approximately 15 participants, including the security officer of the trainees) and talk about current events in the education centre such as accidents, hazardous substances or environmental issues and formulate action targets promptly. The working group follows the premise of 'zero fires, zero accidents' derived from the corporate targets. In this context the focus is the learning experience of new trainees.

Conflicts between departments arise more at the level of legislation if European and German law is incompatible. Then the departments need different instructions to react to these requirements. Thus the legislation for the corporate level must 'be practical as possible' and provide alternate instructions for action. Otherwise this will lead to rule violations (e.g. replacement of banned substances). Meanwhile the motivation of employees to use prohibited substances has decreased significantly during the past years.

Increasing competence requirements in the field of environmental and climate protection

At TKSE the competences of the workforce in the fields of climate and environmental protection have increased. This is a common observation of all workshop participants. Management officers for climate and environmental protection have been installed as contact partners for the parent company at operational level. They are supposed to do daily inspections checking and discussing safety issues, and they are responsible for the training and internal audits of employees. The audit was introduced in the course of the "decentralized restructuring" (e.g. reducing the number to five auditors). The management representatives are regularly trained and subject to disciplinary action of the local management. But they complete the audits independently. This system has proven to be very efficient.

2.2.1.2 Skills, qualifications and occupations (Electrical and Mechanical Technicians)

Competences of trainees in the field of environmental and climate protection

The German legislature sets the basis for training occupations in the training plan. The issue of environmental protection is almost identical for all the technical occupations. The training plan provides a general overview of relevant environmental protection laws. But there are no specific environmental objectives or fields of action ('the trainee can do...'). The trainees only have general knowledge about the legislation, which is just relevant in forms of regulations. The company relies on single projects in order to illustrate legislation in practice. For example, in this context many trainees get to know a lot about REACH although it is only relevant for a few employees. However, a distinction must be made regarding which occupation is involved e.g. a laboratory assistant will have to cope with REACH more often than an electrical or industrial mechanic.

At the beginning of the training several courses are conducted which require initial safety at work instructions. As part of the documentation and compliance with the General Plan, the trainees must confirm their participation by signature. The teaching of basic skills is achieved by a greater orientation on business processes and increased autonomy of trainees. It is less the legislation that is supposed to be the centre of attention but practical communication. Most accidents in the plants are the result of wrong behaviour. There are regular meetings to analyse errors and shape trainees' behaviour patterns (What is the trainee allowed to do and why?). The trainees of both occupations spend 18 months in the technology centre to learn – among others – skills in environmental protection, occupational safety and management, and then progress through various departments in the company.

The workshop participants stated that it is sometimes difficult to combine and satisfy company demands with curricular demands. For example, the trainee will have on-site visits in the company as one part of their occupational health and safety and environment related training; on the other hand, the compulsory (theoretical and vocational school related) content has to be paid enough attention because of its relevance for the intermediate and final examinations. Therefore TKSE has developed its own examination model in the sense of an integrated or holistic education approach. In the course of reorganisation of training based on this approach a mere 'test query' does not exist anymore. The main goal of education is on the one hand to get the trainees into analysing the working process (i.e. what is the trainee to do and what are the options?) and on the other hand to enable the trainee to make a proper assessment of his/her actions (i.e. did the trainee act responsibly according to the guidelines of environmental protection?).

Further education to environmental issues

Altogether there are selected issues that are taught in the course of further training (e.g. German Water Act). In addition, the prevention officer for environmental protection is supposed to communicate developments regularly. For all managers, there is an annual "retraining". If employees would like to be offered a concrete training topic (e.g. water pollutants), they contact the personnel department. One of the main instruments to keep the employees up to date is an occupational qualification plan assessing systematically what issues are relevant and what qualifications are needed at the various workplaces. These areas cover for example legal mandatory qualifications and requirements that arise in the context of commissions (e.g. formal certification for taking of-

fice, forklift operating license). Therefore regular votes are taking place in the enterprise (department manager / employee) in order to organise additional training.

Prospective issues for the training of skilled workers

Conservation of resources is an important issue as well as possible alternatives that are already part of in-house projects. Furthermore, the workshop participants think that issues like energy (wind and solar power) and nuclear phase-out will receive an even higher priority. In turn this has strengthened the work on occupational safety: not only technical skills are important, but the awareness of the possible impact of one's own actions on the environment.

For skilled workers, operating instructions and operational procedures to cope with hazardous substances or equipment will be of special importance (energy resources, filters, etc.). In addition, the skilled workers have to have a high level of knowledge of product and process characteristics (e.g. replacing a pump: how long is the duration of a pump? how energy efficient is the product and are there any alternatives?). In this context skilled workers are taught the use of new technologies and techniques to expand and deepen their knowledge. Moreover, machines are changing due to technical progress (e.g. access and safety precautions) demanding new 'creative solutions'. Working with 'conflict cases' and monitoring process will also be challenging for the workers. These aspects are also relevant for vocational training.

2.2.1.3 Core elements of a 'training module' for the steel industry

Review: the most important legislation and developments

In vocational training, the workshop participants consider the development of a deeper understanding of work processes, the awareness of possible impacts of one's own actions and an increased autonomy as central job requirements for trainees. Still, the question concerning concrete training targets remains. A controversial point during the workshop was the discussion about basic skills and elementary knowledge. Despite the fact that new content was constantly introduced into the training plan, there were only few reductions to compensate this. Time to reflect is considered important in order to be able to 'think and act independently'. And furthermore, there appear to be some skills which are required in the steel industry but which are not part of the training plan. So for the trainees, learning on site should be a central objective.

Desirable elements for the training module

The workshop members think that the module should include measurable goals to provide the trainees with options to evaluate their own actions and to become concretely aware of climate and environmental issues (e.g. resource conservation to understand input / output sizes; wasting energy). The cooperation with the German Federal Institute for Vocational Training (BiBB), already foreseen in GT-VET, is appreciated. The comparability and teaching of basic skills could also play an essential role (What is solar energy? What is wind?). The best possible advancement of basic knowledge seems paramount because it could support the trainees, but also older workers, in increasing their capabilities to reflect upon environmental issues and therefore develop practical “green skills”.

Requirements and outlook

The framework curricula of the VET plan are not static and leave the company some considerable leeway for introducing learning opportunities which also reflect the company's requirements. However, one central result of the workshop is that there is no way yet to include environmental issues in the VET curricula by means of practical projects. As long as environmental considerations remain absent from VET systems “companies [will] have to act on their own”, as the participants say. Altogether, the issues of energy conservation and scarcity of resources will become more central, as well as the issue of CO₂. The use of new technologies will also become more important to keep up with automation and efficiency opportunities, from blast furnace to hydrogen technology. All in all, specific industry-based case studies are considered necessary to complement existing curricula and provide application-oriented knowledge and awareness in everyday work. These case studies are considered to carry educational values which are not covered by the daily business of education. So the cooperation of the vocational schools and companies should be deepened.

2.2.2 Italy: Acciai Speciali Terni (AST)

The aim of AST is to move from compliance to improvement, with regulation seen as the baseline from which to progress. Environmental protection and producer waste responsibility are and will increasingly be a challenge and a critical aspect in the near future for the survival of AST and industry in general.

Levers should be used to set up the basis for future development such as:

- Collective awareness campaigns on environmental protection (*improvement groups, awards*)
- General information on company-produced wastes and handling techniques;
- Location of waste disposal areas serving individual working areas;
- Incentives of eco-friendly behaviours.

Workplace Culture and Practice

Changing behaviours and culture are an important aspect of a strategy. Complete reversals in current approaches to environmental issues, as well as the production cycle, require time and constant reinforcement to change entrenched working behaviours developed over long periods of time.

AST has already pointed out several short term targets it aims to strengthen with continuous specific training:

- To develop/increase the awareness of how maintenance may impact the environment
- To develop and/or spread environmentally friendly behaviours
- To know the distinction between ordinary and special wastes, the related handling methods and the location of storage and disposal places
- To be aware of industrial waste disposal systems and waste reduction practices.

Occupational and Job Requirements

By identifying the environmental aspects of the work of mechanical and electrical technicians AST clearly recognised the need to develop and increase the awareness of how maintenance may impact the environment. The main point of this strategy is developing and spreading environmentally friendly behaviours.

To this purpose, it is of paramount importance to know the distinction between ordinary and special wastes, the related handling methods and the location of storage and disposal places, as far as to be aware of industrial waste disposal systems and waste reduction practices.

Training

At AST training is worked out and administered at the internal Training Centre, an entity recognised as a training agency and qualified to issue certificates and qualifications. On-the-job technical training is developed by AST's own technicians.

Safety training is provided by contract agencies in compliance with the Italian safety regulation. Training includes a base refresher course on the fundamental principles of electricity, mechanics and electronics and courses on the operation of specific plants (*e.g.: operating practices*).

Concerning the environmental aspects, for the time being, training on the job is the only existing way to train new employees in strict cooperation with more experienced colleagues.

Specific training for operators on issues as reference laws and regulations, waste types, classifications and volumes, environmental impact, storage and disposal methods and waste minimization techniques is still missing.

Future Developments

In the recent past, production and operational issues were the priorities, with other issues (including environmental aspects) perceived as secondary. This is now felt to be changing – environmental aspects are 'moving up the agenda' and will ultimately become as central as health and safety actually is. However, greater environmental awareness and workforce engagement is seen as essential to the progress of such an agenda.

2.2.3 Poland: ArcelorMittal Poland (AMP)

According to definition of the occupations for GT VET 600 maintenance technicians are employed in the company AMP: 219 mechanical technicians and 381 electrical technicians.

Required qualifications are: Secondary technical education, personal experience minimum 1 year, substantive and practical knowledge coming from professional experience as well as from education. Professional qualifications are necessary to execute some tasks (e.g. professional qualifications for electricians, conservator of lifting equipment, welding course). But not all employees have the required education. It is possible to have primary or vocational education followed by several years of professional experience and/or training; e.g. the company additionally employs about 150 electrical technicians and 350 mechanical technicians without secondary

technical education, but with professional experience and/or training. The education level and professional experience influence the salary.

Ecological aspects of the work of electrical and mechanical technicians are:

- correct waste management (waste segregation) of Freon, oils, lubricants, isotopes, and sustainable management of resources, materials, energy and packaging,
- obligations to follow environmental regulations in each activity,
- anticipation of environmental threats occurring during work operation,
- appropriate organisation of the workplace,
- correct operation of equipment and proper performance of duties - to reduce emissions to the atmosphere and minimizing noise.

Completed work directly affects the formation of hazardous wastes and other wastes and materials and energy consumption, while indirectly affects machinery and equipment condition. During their work, employees can meet with e.g. unexpected emissions, where the source of its creation is, for example equipment failure, fire of conveyor belts, fire, explosion, and contamination.

Ecological aspects of labour related to health and safety aspects

Appropriate execution of maintenance and repair work influences health and safety of workers employed in machinery and equipment operation. Correct waste disposal of hazardous materials reduces the risk to workers and others; also those associated with the possibility of a major industrial accident (fire, explosion, pollution of air, water, ground). For example, in fugitive emissions, where the source of its creation is for instance equipment failure, it is necessary to use safety glasses and dust masks. Another example is the replacement of fluorescent lamps for energy-efficient light sources (hazardous waste disposal combined with the improvement of lighting in the workplace - the elimination of the stroboscope effect).

Training System in the Company

AMP has an annual training plan. The scope of the training depends on the realised tasks; training proposals (to inform the plan) are reported by individual organisational units. The company does not have a separated formal training program for environmental protection. Environmental

aspects are discussed both in health and safety training and training management systems as well as in the training by their direct superior.

Examples of training packages are: Health and safety periodically for persons employed in blue-collar workers, environmental protection, waste management, industrial serious breakdowns. Training takes place officially, usually during working hours, and is funded by the employer. Obligatory initial and periodic training is conducted in health and safety.

There is also formal and informal training for people whose responsibility is related to EU directives and regulations (e.g. in the field of integrated permits IPPC, Emissions Trading Scheme ETS, REACH), national legislation and regulations at the company level. Each employee has access to the intranet „studnia” („well”), where he or she can become familiar with legal requirements. Additionally, the employee may be targeted for training by the supervisor, with the permission of the training department. Staff familiarity with the requirements of the directives and regulations is carried out mainly by familiarising employees with the internal normative acts (circulars letters, Directives of the General Director, etc.), system procedures and instructions which these requirements are fully reflect.

Directives and regulations shape the training of the analysed occupations, because workers should be aware of the rules in order to perform professional activity properly.

Development of environmental aspects

There are some environmental related developments that were mentioned by the company representatives that might affect or improve training conditions:

- reducing CO₂ emissions, and related with it, improvement of machines and equipment energy efficiency
- changes in technology - towards adaptation to the best available techniques and changes in the production process - optimisation of the manufacturing process, minimising consumption of energy, media, raw materials, amount of waste generated
- changes in laws - intensified regulation, increased fees for use of the environment, strengthened penalties
- cultural changes - increase number of civil interventions, increase pressures from local communities and "green" organisations.

The development of working methods will be directed at increasing the awareness of workers in the field of environmental protection, the introduction of environmentally friendly working techniques: use of innovative, energy and materials saving techniques, efficient use of resources (reduction in electricity consumption, water, natural resources) and the recycling of waste, minimising the potential risks for the environment in case of failure.

All in all there is an increasing pressure in the company on protecting the environment and paying special attention on health and safety. Thanks to implementation of the Program Management of Awareness the ecological and safe awareness of the employees raised – e.g. green competitions and events have been organised. Many internal procedures influenced positively the improvement of occupational safety and reduced environmental negative impacts. Systemic solutions to improve waste management, modernising of the existing machinery and equipment, major changes in infrastructure and automated processes have been introduced to improve environment protection and health and safety.

Efforts made by AMP to improve sustainable development and safe work:

- pro-awareness and pro-motivation activities among employees to care for the environment and safety work
- constant increasing the awareness of employees and environmental culture and observance of safety rules
- increasing the number of internal environmental controls, in particular for installations with a significant impact on the environment
- introduction of motivational elements into the salary system
- conducting environmental education: ecological picnics and awareness action through fun / entertainment, eco-mails, ecological contests, describing the current environmental problems related to individual departments
- increasing financial investments for environmental investment, modernisation and renovation.

2.2.4 The UK: TataSteel

Interviews were conducted with managerial staff from the Environmental Department and the Health and Safety Manager. It is worthy of note that these are two departments, which function separately from each other and with discrete structures. Indeed, they were described as 'very separate', despite recognition that 'environmental issues are clearly safety issues.'

The Environmental Department was established in the mid-1990s. It is comprised of twelve staff and undertakes both compliance work (i.e. ensuring that legislation and regulation is adhered to) and improvement work (through step-change projects e.g. capital expenditure on air quality, waste management and recycling projects). The Environmental Manager reports directly to Director level, which shows the increased significance of the role.

Regulation and Legislation

Compliance with environmental legislation is sought in the areas of waste, air, water, land and groundwater contamination, as well as carbon dioxide emissions under the ETS scheme. Workforce engagement is seen as an essential element in securing compliance targets, although the environmental department has 'limited resources to communicate with the workforce.'

Environmental regulation emanating from the EU was described as having 'a good underpinning logic', but as being highly inflexible and prescriptive. Moreover, it was described as counterproductive at times and as 'driving behaviour in the wrong way'. An example was given, where waste oil from process was being collected, in order to recycle it through the spraying of coal prior to coking. However, this was a breach of the Waste Incineration Directive, despite the 'waste' oil being purer than oil bought in for such purposes. Moreover, the ETS was described as highly bureaucratic, with a vast amount of time and money having to be spent on monitoring, assessment, calibration as opposed to trying to reduce.

Company Strategy

The company aim is however to move from compliance to improvement, with regulation seen as the baseline from which to progress. Improvement activities, which are comprised of capital investment in key areas of the business, are based on cost-benefit analysis and auditing. There is a pre-allocated 'pot' of £5 million and applications have to be made for that funding for schemes identified within the department. Improvement is seen as coming from the changing of behav-

iours/culture, as well as the implementation of current technology and the identification of new technologies.

The TataSteel takeover is seen as being influential in moving 'environmental issues up the agenda'. Changing behaviours and culture are an important aspect of strategy.

Workplace Culture and Practice

Participants referred to 'The Journey', the on-going culture change programme being implemented at the plant. Fundamentally, the 'Journey' aims to change attitudes to work and therefore, behaviours, instilling a sense of pride in work and ensuring that all see 'continuous improvement' as an essential and habitual part of their work.

Behaviour and attitude change are seen as interchangeable and thus, there are a raft of practical measures in place, which are designed to change behaviours and reinforce attitudinal change. Work protocols/standard operating procedures are explicitly specified – and accessible – for all tasks. Environmental and safety aspects are incorporated within these protocols. For example, the procedures for dealing with acid leaks, oil spills or preventing gas emissions are documented within the protocols. Such behaviours are reinforced by 'environmental/health and safety walkovers', conducted by staff from the respective departments (these supplement more formal 'Lead Safe Audits'). Walkovers essentially involve staff asking those carrying out tasks about what they were doing and questioning them as to the environmental/safety aspects of the work being undertaken. Workers might be asked to explain correct procedures in the event of spillage, for example, or how waste should be disposed of. There are occasions where a task/job has changed/evolved, but the safety/environmental aspects have not been incorporated into procedures; the right adjustments do not get made. Moreover, respondents identified that walkovers take time and there are a limited number of staff available.

Behaviours are also reinforced through target-setting and appraisals, which incorporate measurement against such goals.

The key role of management 'buy-in' to the environmental agenda was emphasised – if the area has a 'good' manager, this is reflected down the hierarchy. Heavy-end areas, with the greatest potential for environmental risk, were described as those requiring most improvement.

Occupational/Job Requirements

The environmental aspects of the work of mechanical/electrical technicians were identified (e.g. for the former, waste disposal, oil and grease, what to do with removed parts and the latter, removal and disposal of cables etc.). The need to ensure that new contractors are made aware of the environmental/safety aspects of their work was stressed. It also emerged that heavy-end was a particular focus for raising environmental awareness, and one interviewee stressed that operators should be the targets of any awareness training.

Training

The formal induction for employees, including apprentices, includes a section on environmental issues, which is delivered by staff from the Environmental Department. There are also specific environmental training packages, which will be tailored by occupation and section. How frequently such training is delivered was unclear, as were the reasons that prompt delivery. Environmental staff will attend departmental meetings, held every month for managers. In such meetings, any environmental breaches will be discussed, with a view to implementing appropriate action. Moreover, updates and briefings on any new environmental developments will be delivered in such forums.

For the workforce in general, there is an emphasis on task-based learning, or learning by doing. Protocols and procedures, which specify correct and safe ways of working, are aimed at shaping behaviour and work performance. However, there was acknowledgement that procedures might change, but practice does not always keep pace. Moreover, novel safety and environmental issues that evolve out of changes to work practice are not always recognised and incorporated into procedure or practice. It was also recognised that the 'worst offenders' (contractors and sub-contractors) might be missed.

In terms of more formal training, the workforce attends Journey Days, where environmental aspects might be discussed; has 'Toolbox Talks' with section management; and might attend 'Industrial Forums', where speakers from the Environment Agency or the Welsh Assembly might speak about the broader implications of environmental breaches.

Future Developments

Interviewees were unanimous in the view that previously, production/operational issues would be the priority, with other issues (including environmental aspects) perceived as secondary. This is now felt to be changing – environmental aspects are ‘moving up the agenda’ and will ultimately become as central as health and safety has. However, greater environmental awareness and workforce engagement is seen as essential to the progress of such an agenda. Training is acknowledged to be a central plank in any such programme – so as to move away from the “current fire-fighting, reactive approach of the Environment Department” - but gaps in current provision were recognised.

Possible recommendations include the use of ‘Training Champions’ located within sections (following the model of the new Energy Optimisation department, who are based in sections, working on specific projects), who would disseminate and reinforce good practice and on-going education in correct protocols. Another idea was to incorporate and emphasise environmental perspectives into training and practice on risk assessments. All workers are trained in the process of risk assessment and are encouraged to conduct an on-the-spot, two-minute risk assessment for all jobs (alongside the written, formal risk assessments that are located in, and can be accessed from, a computerised database). The Safety manager proposed that the identification of any potential environmental hazards and associated protective and preventative measures should be emphasised, alongside the assessment of personal safety hazards.

3. Reflection of Green Skills Requirements in the National VET Systems

This chapter summarises the results of the VET system analysis on the background of the findings of chapter 2 (industry requirements on green skills), more details on national findings could be found on the website (www.gt-vet.com). The summary begins by reviewing the European Union's VET strategy as a main and common background, followed by its 'green skills' policy and a discussion of how this is integrated with its overall approach towards VET. The document will then outline the VET and green skills initiatives that exist at the sectoral level, i.e. those that pertain to the European steel industry. Each nation's general approach to initial vocational education and training (IVET) will then be presented, with a specific focus on the position of the apprenticeship system therein (beginning with Italy, followed by Poland, Germany and the UK). The relationship between the 'green skills' agenda and the IVET system in the respective nations will then be discussed, within each national overview. Each of the national sections will end with an overview of the empirical data gathered through research conducted with relevant stakeholders (i.e. IVET providers, partner steel companies and apprentices). The report will end with a summation of the analysis of these findings and the implications for the European training module on greening technical VET.

3.1 EU VET Strategy and 'Green Skills' Policy

In this section, the two main strategies with implications for VET will be outlined, prior to an identification of the specific mechanisms adopted to advance VET in member states, namely the Copenhagen Process and the Bruges Communiqué. This section will conclude with a brief overview of the EU's drive for sustainable development and its recognition of the role of green skills therein.

Strategies - Lisbon and Europe 2020

The Lisbon Strategy, formulated by the European Council in 2000, articulated the EU's strategic intent to "become the most competitive and dynamic knowledge-based economy in the world, capable of sustainable economic growth." To these ends, a ten-year programme, aimed at revitalis-

ing growth and sustainable development across the EU, was established and this underpinned EU policy formulation within the last decade (ETUC, 2006).

EU education and training policies gained impetus with the adoption of the Strategy (Europa, 2011). The main objectives were, essentially, to raise the quality and effectiveness of education and training systems in the EU to the highest levels and to ease access of all to education and training. To these ends, the European Commission initiated the Education and Training 2010 work programme (Council of the EU, 2002), with specific education and training benchmarks set for attainment by 2010.

The Lisbon Strategy was updated through the EU2020 strategy. This latter maintains the themes of 'growth and jobs' and places the period 2010-20 in the context of recovery from the economic crisis and the urgent need for sustainable economic development. The EU 2020 strategy articulates three main priorities: *smart growth*, *sustainable growth* and *inclusive growth* (European Commission, 2011). Of course, for the purposes of this project, sustainable growth is of most interest. It is envisaged that the EU will stimulate sustainable growth through two flagship initiatives: 'Resource-efficient Europe', which aims to decouple economic growth from resource and energy use by reducing carbon emissions, promoting greater energy security and reducing the resource intensity of production and consumption; and 'An industrial policy for the globalisation era', which aims to support businesses as they respond to globalisation, the economic crisis and the shift to a low-carbon economy.

3.2 Specific EU Mechanisms for the Enhancement and Advancement of VET - The Copenhagen Process and the Bruges Communiqué

The Copenhagen Process

The Copenhagen Process was launched in 2002, in order to strengthen pan-European co-operation in VET and concomitantly, the alignment of European and national-level practice. Member states have committed themselves to a set of common priorities and therefore, several universal European principles and instruments have been developed, so as to support lifelong learning, ensure enhanced quality of VET provision and facilitate educational and job mobility within and between member states. Principally, the instruments focus on the improved quality of VET provision at national level through the development of a European quality assurance system

(EQAVET); the facilitation of comparisons of qualifications across Europe through the creation of the European Qualifications Framework (EQF) with which national qualification frameworks must align; and the development of a credit system (ECVET), so that work experience and qualifications gained in one member country can be validated and recognised in another.

The Bruges Communiqué

In December 2010, the European Ministers for Vocational Training, the European Social Partners and the European Commission met in Bruges to set the priorities of the Copenhagen Process, and thus the common objectives for vocational training, for 2011-2020 (Europa, 2010.). In light of the challenges currently facing the EU, the need for responsive, flexible, high quality education and training systems is emphasised. The Communiqué states that the capacity of VET to respond to the changing requirements of the labour market must be enhanced, and that these changing labour market needs must be integrated into VET provision (content, infrastructure and methods) over the long-term. The transition to a green economy is also identified as a 'mega trend', which impacts on skill needs across many different jobs and sectors. The Communiqué establishes that the labour market requires a balance between developing generic green skills (e.g. reducing waste, improving energy efficiency) and more specific skills (e.g. the development and utilisation of green technology).

The EU and 'Green Skills' Policy

The EU's Sustainable Development Strategy (SDS) was launched under the auspices of the Lisbon Treaty in 2000 and this overarching policy goal was renewed in 2006. The 2009 Review of the SDS outlines progress made, in addition to identifying areas for further action. The Review states that whilst the EU has mainstreamed SD into its policies, the economic crisis of 2008-09 served to highlight that sustainability is a key factor for member states' financial systems and the economy as a whole (European Commission, 2009). It refers to the Recovery Plan for jobs and growth (a fiscal stimulus of EUR 200 billion) launched by the Commission in 2008 (which focused investment on clean technologies and infrastructure) and emphasises how crucial it is that measures to support the economy and reduce the social impact of the financial crisis are compatible with long-term sustainability goals. The Review emphasises that the EU must turn the crisis into an opportunity to address financial and ecological sustainability, and develop a dynamic low-carbon and resource-efficient, knowledge-based, socially inclusive society. This building of a

green economy is increasingly vaunted as a vehicle for job creation at European and national levels (e.g. European Commission, 2009; Cedefop, 2009; Innovas, 2009; Levy, 2010). The EU has also explicitly recognised that green jobs require green skills, and that these play a critical role in supporting a low-carbon economy (Environment DG, 2011). EU policy documents in this area clearly advocate government intervention at national level through, for example, subsidising research and early stage deployment into new green technologies. This is seen as being crucial in supporting such job creation.

However, despite the fact that education and training have been identified as the critical foundation in attaining sustainable development and the creation of a green economy (European Commission, 2009; see also GHK, 2008), research by ECORYS (2010) for the European Commission highlighted the existence of a 'green skills gap'.

3.3 The Sectoral Level – Strategies for the European Steel Industry

The green skills strategies, policies and practices of a number of influential sectoral bodies that operate at the European level were reviewed. The bodies were the European Metalworkers' Federation (now industriALL), the European Steel Association (EUROFER) and the European Steel Technology Platform (ESTEP), aimed at maintaining the global competitiveness and sustainable future of the European steel industry. In essence, the review found that whilst each of these institutions has issued policy statements on the subjects of climate change, environmental protection and sustainability, as well as on training, development and lifelong learning, there is currently very little explicit emphasis on a green skills agenda.

EUROFER exists to represent all steel producers operating within the EU. Its members are therefore steel companies and national steel federations. It represents the common interests of its members vis-à-vis third parties, notably the European institutions and other international organisations, and thus, aims to influence policy. Its general environmental position was outlined in the advanced report of GT VET on Industry Job Requirements (work package 2). Of particular salience is that in a number of policy documents, EUROFER has highlighted the growing challenge posed to the European steel sector by EU environmental and climate change regulation (EUROFER, 2010). Indeed, the very future of Europe's steel industry is identified as being dependent on the European internal regulatory framework.

Training and lifelong learning policy are formulated through the process of social dialogue, with the other party being the European Metalworkers' Federation (EMF) – now industriALL. A specific objective of the social dialogue process in this case is the anticipation of the skills needed in the sector, as well as concomitant workforce development.

In addition to its participation in Social Dialogue, the EMF has launched two relevant initiatives in the area of education and training. These are the EMF Qualification Initiative of 2001 (EMF, 2001) and more recently, its 'Education, Training and Lifelong Learning – A Must for Sustainable Development' position (EMF, 2010). The former aims essentially to develop collective bargaining on training whilst the latter highlights the crucial role of education and training for sustainable development. In this latter, the EMF argues that the Commission's emphasis on education and initial training systems (basic school education and university) for the creation of new skills that fit with the requirements of new 'green' jobs is somewhat misplaced. The EMF's position is that the emphasis should be on continuing education, as it is through such mechanisms that effective responses to the cyclical requirements of competence needs can be made. To this end, the EMF argues that the EU and the Member States must mobilise substantial financial means in order to allow new green jobs to emerge, facilitate the transformation of those that already exist and engage in the adaptation and reconversion of existing competence mainly via vocational training (although a role for initial training is also envisaged). Thus, the EMF states that educational and training systems must be more responsive to the challenges of fast-moving, disruptive technological change (ICT, green jobs and energy constraints, nanotechnologies, etc.).

Both the EMF and EUROFER work in close co-operation with the European Steel Technology Platform (ESTEP) in order to promote training and lifelong learning in the steel industry. ESTEP is a European-wide research network, which brings together the whole European steel industry, research centres, universities, the European Commission and Member States, as well as the other European institutions and trade unions, in order to create a coherent response to the challenges that impact on the European steel industry namely, the growing impact of globalisation, the matching of steel supply and demand and the climate change issue. In so doing, it aims to strengthen the EU-27 partnerships. More than 120 experts meet several times a year so as to implement and update the body's Strategic Research Agenda (SRA). The SRA is a key part of a sustainable development policy aimed at maintaining the global leadership of the European steel

industry. Skills development of the workforce in line with technological advance is one of the anticipated outcomes of the research agenda.

3.4 Green Skills Reflection in the National VET Systems

Beneath the document analysis (detailed national reports are available on the website: www.gt-vet.com) in interviews or workshops with company and VET system representatives the industry demands for green skills were discussed in its correspondence with the existing vocational education and training systems of the involved countries, especially concerning the regional frameworks.

3.4.1 Italy

Within the vocational education/school system, the researchers found that there was no specific 'chapter' on environmental issues in the national curricula handbooks. As such, no training modules on environmental issues have been prepared, or are being delivered. There is seemingly a growing awareness on the part of teachers about environmental issues, but this is currently at a very general level and is not being specifically applied to workplace procedures and practice.

Regarding the regional VET path (FPI), delivered and administered by the regions rather than the state, the vocational training centre in one region (Umbria) had recently incorporated a training module on 'legislative matters and professional procedures for making work environmentally safe' within the apprenticeship training handbook.

The company (Acciai Speciali Terni) requires that electrical and mechanical technicians have six months' on-the-job training, so as to be fully familiar with the operation of plant. This is supplemented by general off-the-job training, on topics such as maintenance operations. For apprentices in the region, this is carried out by the regionally-accredited vocational training centre of AST. AST's own technicians devise and deliver this off-the-job training, which encompasses fundamental principles of mechanics and electrics, as well as courses on the specific operation of plant and working procedures. In accordance with Italian law, safety training is carried out by relevant contract agencies.

The company interviewees identified that waste identification, handling, management and disposal is of particular salience for the role of maintenance technician and moreover, that such

training is missing from current provision. It was identified that technicians could benefit from environmental training, targeted at raising awareness of the environmental impact of waste, relevant legislation, waste types and classification, waste minimisation techniques, as well as storage and disposal. It was recommended that these technicians need to understand the consequences of 'wrong' behaviour in such matters and the impact upon colleagues, the company and the environment. To change behaviour, it was advocated that eco-friendly behaviour be incentivised, alongside the running of collective awareness campaigns on environmental protection, with awards for improvement groups. Such measures would reinforce the provision of information on company wastes and handling techniques.

3.4.2 Poland

A comprehensive approach to developing 'green' skills in Poland is missing; appropriate policy initiatives are lacking. Government activity is usually limited to raising general environmental awareness and encouraging pro-environmental behaviours. Currently, there are no dedicated 'green'/environmental modules in the education curricula for either mechanical or electrical technicians. If, however, 'green' elements are introduced into other subjects within the framework of environmental pathway, they may be evaluated as a part of partial/final exam. The inclusion of environmental aspects is usually at the discretion (and preparation) of the teacher and it remains at the level of general principle. However, health and safety modules constitute a part of two of the required thematic blocs that comprise the curricula for the two occupations.

Indeed, interviewees confirmed that, within the educational provision at school, all issues connected with environmental protection are treated marginally or are not raised at all.

However, all apprentices are required to attend and participate in the internal training provided periodically by the host enterprise. The content of such training includes the subjects of health and safety, integrated management systems, environmental protection and the handling of waste materials amongst others. Interviewees emphasised that during training, much weight is accorded to energy/electricity conservation, the safe storage and utilisation of dangerous materials and general environmental issues. Moreover, the relationship between health and safety and environmental protection is similarly stressed. As a result of company training, apprentices exhibited a high level of environmental awareness and offered accurate definitions of 'green skills' and how they applied to their roles.

The conclusions and recommendations drawn from the research are as follows:

- More effective environmentally-oriented education at each stage of the school education process, and particularly from an early age, so as to change mind sets;
- Company training should be specific, realistic and applied to roles and should include a lot of practical examples;
- Awareness training for employees – making workers aware of their impact on environment, and also of the potential for negative future consequences (at individual, organisational and societal levels) if there is a lack of environmental protection;
- Supplementing training programmes through running campaigns, organising events, provision of information on the subject of environmental protection;
- Co-operation between the education institutions and industry is essential, not least because teachers should be knowledgeable about the specific nature of roles.

3.4.3 Germany

The framework curriculum for industrial mechanics consists of 15 learning fields, whilst that for electrical technicians is comprised of 13. Although in both curricula, there is no dedicated specific learning field for environmental protection or occupational safety, these aspects are incorporated and integrated with relevant job-specific topics. The cultivation of green skills and their application are explicitly names in 9 of the 15 learning fields for industrial mechanics and in 7 of the 13 fields for electrical technicians. Moreover, both curricula contain general instructions as to issues of environmental protection. Vocational schools have to commit to advising apprentices of the 'environmental threats and accident risks' that might arise in their occupational life' and furthermore, to advise them how to avoid, prevent and minimize such risks. Students are also to be taught how to observe environmental rules and regulations, as well as those pertaining to health and safety.

The school staff interviewees stated that they aim to inculcate general environmental awareness in the apprentices, attempting to broaden their understanding of sustainability and how their actions can make an impact. Techniques such as Life Cycle Assessment are taught. Environmental aspects such as emissions, waste, resource efficiency and water are covered in class. The educators said that their challenge is to change behaviour, through sensitizing students to an environmental perspective and empowering them to take appropriate action. The benefits of such be-

haviours – for individual and company – are stressed, so as to increase motivation. The VET examination contains five obligatory questions on the environment and sustainability.

The trainees' perspective, by way of contrast, is although they are very keen to have additional qualifications/educational provision in this area, that such issues are only covered in a superficial way in school and that there is hardly any emphasis on environmental aspects. As such, they stated that their levels of environmental awareness are a result of personal background and experience at secondary school. They identified waste, hazardous materials and particulates as particularly important for their roles, with emissions, resource and energy efficiency issues seen as less crucial.

The trainees emphasised that there should be stronger links between school and company, and that concrete, specific examples are essential for effective learning. They also stressed that applied learning – 'learning by doing' – was the most effective way to learn.

This perspective was reflected in the school/company data, where participants also stressed the need for cooperation between these parties, perhaps through the implementation of shared projects on an annual basis. The need for project and action-oriented learning was also stressed, in line with trainees' own proposals. It was suggested that theoretical input should be reinforced with concrete actions. That means for the European Training Module, it would be useful to collect and develop examples of concrete learning, projects and applications of tools, for use as learning materials. It was also suggested that critical incidents could be documented and form the basis for analysis – students could work out what went wrong in a situation and how it could have been prevented through the identification of the appropriate actions at each stage. It was also recommended that several smaller modules might be a better option. These could be delivered over the whole training process.

3.4.4 The UK

The UK Government has passed several significant pieces of environmental legislation, and has issued strategy documents aimed at securing the transition to a low carbon, resource-efficient economy (LCREE). Despite this, environmental skills training had not been a high priority within the UK until relatively recently (ECORYS, 2009).

Despite recommendations of key bodies that all technical qualifications should be 'greened', the interviewees from the responsible Sector Skills Council for Science, Engineering and Manufactur-

ing Technologies (SEMTA) stated that green skills are not a subject that is raised or discussed in the Sector Group meetings they attend with employers.

The college staff interviewees stressed that working safely was the main emphasis and that they do not deliver any dedicated environmental modules.

All apprentices interviewed were clear that there was no dedicated, specific module for environmental legislation or practice. They were all unfamiliar with the term 'green skills' and could not offer a definition (although they were able to list environmental factors associated with their jobs, namely waste disposal and cleaning up oil spillages). They were in accordance that environmental legislation and practical issues were only briefly alluded to in the college provision. Health and safety, on the other hand, was covered in great detail but the links between this and environmental aspects were not made explicit. Environmental issues are an implicit part of practice – trainees are taught about the 'right' and the safe way to do thing, but environmental risks/prevention/consequences are not drawn out or explicitly identified/analysed.

Moreover, as part of the qualification and prior to starting work onsite, apprentices have to work through a booklet entitled 'Employee Rights and Responsibilities' ERR. This provides detailed information about relevant legislation and apprentices have to demonstrate that they are aware of this and how it impacts on ways of working. ERR consists of health and safety and equalities legislation. Environmental legislation is entirely absent.

In the workplace, learning is experiential and somewhat unstructured. It takes place through observation, questioning and learning-by-doing, under supervision. Safety is strongly emphasised and apprentices are taught to undertake 'two-minute' risk assessments before starting any job. The two-minute assessment is designed to supplement the written risk assessments, which exist for all tasks.

In terms of formal training at the workplace, there is a brief introduction to environmental aspects and the impact on the plant on the formal induction that all apprentices are required to attend prior to starting work on-site. Thereafter, environmental matters are discussed on Journey Days, training days for the whole plant which are part of the culture-change programme at Tata Steel. Environmental issues might also be covered in 'Toolbox Talks', ad hoc briefings on relevant matters held by line managers in section.

Formal, dedicated training on environmental legislation, regulations and impact on the plant is provided to graduate trainees and managers (this is internal but some managers are required to

undertake formal courses and qualifications of the Institute of Environmental Management and Assessment (IEAM), but this is not available to apprentices or operators (although a one-week IOSH [Institute of Occupational Safety and Health] course is now part of the apprentices' learning, funded by the employer).

Apprentices were clear that they were taught work protocols and the correct practices that had to be adhered to. They knew what to do, for instance, if they spilt oil. However, as one apprentice highlighted, they are not told why this is, what should be done or what the consequences would be, if they did not follow the procedure. They acquire skills then, without knowledge. This suggests that the technical certificate is not providing requisite underpinning knowledge. Apprentices also highlighted a lack of applied examples in the college provision, particularly in the first year of the programme, when they attend generic training with apprentices from other workplaces. Sector/company specific training in green skills would be beneficial.

In sum, there is no dedicated module at college and a lack of applied examples. Formal training at the workplace is restricted to a short session on induction and sporadic Journey Days thereafter. There is a lack of focus – health and safety and environment are treated as separate, rather than as integrated. Environment needs to become an implicit part of risk assessment. There is also a problem of delivery – given that line managers are responsible for development, practice varies across sections. Training for trainers is important too.

3.5 Conclusions

Clearly, there are a varied set of curricula, policies and practices, which is indicative of different levels of skills, competence and knowledge across the case study countries. Within the companies varied practice was evident and given the lack of centralised guidance/policy, it can be inferred that the emphasis accorded to environmental matters differs, based on the importance placed on such issues by section heads. The GT VET project requires a clear definition of green skills from which to work; such a definition should be formulated bottom-up to reflect the specificity of the steel sector and top-down to incorporate wider 'green' policy imperatives (such as those deriving from EU 2020 strategies).

Wider recommendations, common to a number of cases, are that there should be greater cooperation between companies and schools/colleges on (green) skills development, so as to ensure a clear, coherent and consistent message. More particularly, school content must be rele-

vant, specific and applied to company practice. Further, it is important that in-company training programmes are reinforced by wider campaigns and information distribution.

In terms of module delivery, one apposite proposal is that a series of smaller modules be run over the course of the apprenticeship training. The focus of the introductory module could be relevant environmental legislation and its impact upon and application to the steel industry. Modules on specific practice could then ensue. The main consideration is that such training should be applied and role-specific, with numerous examples of concrete learning provided, and supplemented by the use of projects and applications of tools, such as Life Cycle Assessment. It was also suggested that critical incidents could be documented and form the basis for analysis – students could work out what went wrong in a situation and how it could have been prevented through the identification of the appropriate actions at each stage. These are deemed to be essential for effective learning by the trainees themselves. An emphasis on consequences of behaviour – the ‘why’ as well as the ‘what’ – and the implications for individuals, the organisation and society should be included.