

Climate change and 'green' skills in the workforce

In the nineteenth century, the discovery of ice ages led scientists to conclude that climate could change on a global scale. Joseph Fourier, recognised that the atmosphere keeps our planet warmer than if it were exposed directly to space. In 1860, John Tyndall, a physicist, discovered that the key to understanding this phenomenon lies with the proportion of gases that make up the atmosphere, including carbon dioxide (What goes up...,2019).

Svante Arrhenius, a chemist who was well ahead of his time in formulating various theories, pondered how human activity contributes to climate change. In the same century, it became clear that carbon dioxide was a greenhouse gas - in 1850, Eunice Foote showed that the rate at which a sealed jar of air heats up in sunlight depends on the level of carbon dioxide in that air. Since then, various scientists have begun to consider the impact of the harmful effects of CO₂ on our environment (Computing climate change...,2020).


The industrial revolution has made coal consumption commonplace. Back in 1900, burning coal provided 2 billion tonnes of CO₂, in 1950 this figure tripled and in 2019 it was 20 times greater. However, until the middle of the 20th century, politicians were not convinced that we were in danger of climate annihilation. Moreover, it was thought that all carbon dioxide could be absorbed by the oceans. And it was not until 1950 that Roger Revelle, an American oceanographer, showed that this was not the case. It was he who persuaded politicians to measure changes in the atmosphere every year. In 1965, after the publication of a report prepared by America's Presidential Science Advisory, it became clear that CO₂ levels were increasing every year (What goes up..., 2019; Revelle and Suess,1957).

However, a lot of controversy and debate has been generated by the theory of Eigil Friis-Christensen and Knud Lassen. The scientists tried to demonstrate that they had reached a surprising conclusion - according to them, there is a correlation between the lengths of solar cycles and temperature levels in the northern hemisphere (Friis-Christensen and Lassen, 1991).


Later, however, the high correlation between sunspot cycle length and global temperature and the hypothesis that this could explain the current global warming proved untenable (Laut and Gundermann, 1998).

The various warnings formulated by scientists are becoming a reality. In 2018, two hurricanes - Hurricane Florence in America and Typhoon Manghut in East Asia - occurred almost simultaneously. Scientists have linked these phenomena to increasing greenhouse gas emissions, warming oceans and climate change. Measurements taken at a depth of 2,000 metres have shown that ocean temperatures are rising and various climate models indicate that this will cause perpetual storms (Thirsty planets..., 2029).


When writing about climate change, it is important to emphasise that so far no so-called climate targets have been met, and according to a recent report by the UN organisation, temperatures have already risen by 1° C. as a result of human activity, and the planet could exceed this threshold of 1.5° C. as early as 2030. J. Worland, J. and J. Kluger, found that to maintain the target temperature, renewable energy will have to supply at least 70% of the world's electricity in 2050, while coal consumption will essentially have to disappear (Worland and Kluger, 2018). A new report, published in Seoul, shows that we are a long way from this goal and that even the commitments made in 2015 by around 190 countries to reduce greenhouse gas emissions will allow temperatures to rise by around 3 ° C by 2100. What's more, a significant number of countries, cities or companies say they will only change things in 2050. In contrast, the introduction of so-called clean technologies will not take place until 2070 (Worland and Kluger, 2018).



According to various estimates, in just a decade the number of people affected by hunger will exceed 840 million, or 9.8 per cent of the population. And this is only the beginning. Twenty-five million more children will go hungry by the middle of this century as climate change leads to food shortages (Flack et al., 2021).



The climate change debate is complex. For we are dealing with the involvement and interests of companies that control the supply of fossil energy.



Climate change is predicted to adversely affect agricultural yields and the difficulty of feeding people. Climate change is making farming and, therefore, food production increasingly difficult. Many studies indicate that climate change is contributing to malnutrition and even famine.

It is comforting to know that the price of environmentally friendly technologies is falling. Solar panels, for example, now cost around 89 % less compared to 2010. In 2015, 24 countries (including China and Germany) pledged to double their R&D spending on new pro-environmental technologies. Not only governments, but also companies themselves are investing (e.g. IKEA, Microsoft, Unilever, also oil companies e.g. ExxonMobil) (Sustainable investing..., 2020).

Climate change is prompting economists to look for different ways to reduce greenhouse gas emissions. Both so-called carbon prices and carbon taxes are being considered (cf. The contentious and correct ...2020).

However, eco-friendly ventures are ethically questionable. Consider cobalt, which is used to make electric batteries. Around 60 % of the cobalt deposits are located in the Congo. In 2020, despite the closed mines, around 2,000 people were trying to mine cobalt every day despite having to share the profit with corrupt guards. It is not just greed or the desire for a quick return on investment that drives the economy and causes social inequality. Investment in green projects can also be linked to moral or ethical judgements. As we know, 70% of cobalt is mined in the Congo, a country with a rich corrupt history. The sector exploits poor populations (Caneiro Oliveira, et al., 2020).

Green deal

In 2019, the European Commission presented a new programme, called the European Green Deal. According to the main objective, by 2050 at the latest, the European Union should achieve climate neutrality, understood as reducing greenhouse gas emissions to net zero. Thereafter, the European Union will aim to achieve negative greenhouse gas emissions. According to the intermediate climate targets for 2030, the European Union and the member states will reduce greenhouse gas emissions by at least 55% by 2030 compared to 1990 levels.

The main challenge is to develop effective tools to decarbonise the economies of both EU member states and its economic partners. According to A. Samborski, the objective of the adopted package is to reduce and then eliminate net greenhouse gas emissions. The following regulations and economic initiatives are of particular importance for the operation of energy companies: European Climate Law; European Industrial Strategy; Roadmap for a Closed Circuit Economy; Clean, Affordable and Secure Energy (Samborski, 2022).

One of the huge challenges is the introduction of circular economy principles.

According to D.Puciato - "The circular economy model is based on three principles (World Economic Forum, 2016): (1) the protection and enhancement of natural capital by controlling scarce resources and balancing the flow of renewable resources (e.g. substituting fossil fuel energy with renewable energy or using the maximum sustainable yield method to conserve fish stocks), (2) the optimisation of resource efficiency through products,

components and materials that always operate at the highest level of utility, both in technical and biological cycles (e.g. extending product life cycles), (3) promoting system efficiency through the identification and internalisation of external costs, i.e. water, air and soil pollution, noise, climate change and related health damage to society" (Puciato, 2022, p.20).

Poland has adopted various programmes to implement the green deal on the one hand and to foster the creation of new jobs on the other. In official documents published by the Ministries of Climate and Environment, one can read that the draft Energy Policy of Poland until 2040 assumes that 300,000 jobs will be created in the coming decades " in areas related to RES, offshore wind energy, electromobility and others."¹ And further: " achieving climate neutrality requires, among other things, the large-scale introduction of hydrogen use technology. According to the Polish Hydrogen Strategy (PSW) until 2030 with an outlook until 2040, hydrogen will become one of the key energy carriers. Its use in power generation, heating, transport and industry will increase. Among other things, 800-1000 domestically produced hydrogen buses are planned to be on Poland's roads by 2030"².
- green hydrogen report announces.

Meeting environmental targets is difficult, as the recent history shows. In the previous period, not a single target was met for water quality (EU's 2000), air quality (2008 directive) or zero-emissions buildings (Green targets).

The scientific findings are convincing that decarbonisation cannot be achieved through single instruments, such as carbon pricing alone.

What is needed is widespread action to foster the reduction of barriers surrounding the implementation of the Green Deal.

T. Borys, M. Bugdol and D. Puciato identified as many as ten main barriers to meeting climate targets. These are:

- lack of a uniform policy to achieve targets by major emitters;
- low public awareness of risks;
- the dominance of a short-term perspective and the desire for quick returns on investment;
- unethical conditions for investing in green projects;
- economic volatility;
- anti-environmental measurement of economic growth;
- inequality and climate justice issues;
- resource and technological constraints;
- political and institutional constraints;

¹ „Polska recepta na nowy zielony ład” - Ministerstwo Klimatu i Środowiska - Portal Gov.pl (www.gov.pl), odczyt 27.07.2022

² Raport „Zielony wodór z OZE w Polsce” - Ministerstwo Klimatu i Środowiska - Portal Gov.pl (www.gov.pl), odczyt 27.07.2022

- the lack of uniform legislation and market conditionality (Borys, Bugdol, Puciato, 2022).

In order to understand how difficult it is to achieve the green deal, it will be enough to cite some information on one selected barrier. For example, we will look at the CO2 emissions trading market. This covers only one fifth of the emissions of all gases. Only the introduction of the same regulation will contribute to meeting environmental targets. Emissions prices are growing at a tremendous rate, but this market does not cover all areas of our lives. For example, maritime transport is only expected to be covered by the programme in a few years. Road transport and emissions from buildings may be covered by the separate system (The great disrupter...,2020).

The current CO2 emissions trading scheme is attractive to speculators, to large market players. The trading system for these permits may favour those who are the largest, with the most financial resources. In February 2021, an emissions permit trading market was launched in China. However, it did not cover all industries. Companies only have to pay 20 % if emissions exceed set standards. The maximum fines are around \$4.5k (Cleaning up...,2021).

According to experts, there are currently four problems:

- adapting infrastructure and supply chains to changing weather conditions.
- increasing environmental charges mainly for greenhouse gas emissions.
- increasing risk of litigation.
- the need to introduce environmentally friendly technologies, machines (green machines) (Bugdol, Puciato, 2022; Special report..., 2020).



Definitions of competences

Before describing the so-called green skills/competences of employees, it is worth answering the question of what competences are. Of course, in practice they are understood, defined and studied in different ways. Competence - according to the International Organisation for Standardisation - is "the ability to apply knowledge and skills to achieve intended results" (PN-EN ISO 9001:2015, Quality management systems - Requirements, PKN, Warsaw 2016, pnk 7.2).


The most popular ISO 9001 standard lists the following elements of competence: education, training, experience, skills. It recommends:

- defining the competences of personnel with an impact on quality (i.e. all entities with an impact on quality),
- evaluating the effectiveness of the activities carried out (e.g. whether the determination of competences is in accordance with needs, development plans, whether it serves the achievement of objectives),
- maintaining records (including these of competence definition),
- providing training or other activities aimed at ensuring adequate competence (these other activities are e.g. rotation, self-study, internship in another company, etc.) (cf. PN-EN ISO 9001:2015, Quality management systems - Requirements, PKN, Warsaw 2016, pnk 7.1.2).

Of course, in various publications we find many different classifications of competences and components. Competences have many categories. For example, T. Oleksyn (2006) lists: experience, skills, creativity, innovation, responsibility, entrepreneurship, professionalism, availability, ability to cooperate, communication competence, assertiveness, effectiveness and efficiency.



It is important to remember to assess competences correctly. Not always those competencies that are useful in the current job will be useful in higher positions - as a rule of thumb, not every good sales person will be a good sales manager. "Excellent sales performance increases the likelihood of an employee's promotion, but is associated with sales declines among the new manager's subordinates" (Fitzgerald, 2018, p.4).



The extent to which hiring managers are willing to share knowledge is also an issue. Already F and L. Gilbreht proposed a three-tiered system of promotion-everyone does their job, prepares for a one-tier promotion and trains their successor.

It is recommended that competences should be identified at several stages: during the hiring process, at the end of the adaptation phase, after a prolonged absence and periodically during the job. Even a comprehensive competence development programme can be drawn up.

The determination of competence applies not only to employees (people working under an employment contract), but also to service providers (people employed under civil contracts or providing services as sole proprietors). When there is an environmental emergency, it does not matter who the employee is. Everyone needs to know how to act in such a situation.

The term "green" competence is becoming increasingly common in various studies. According to Ł. Kozar, such competences are related to how employees use their knowledge and skills in practice to apply pro-environmental solutions in an enterprise. He lists behavioural - 'soft' green competences (e.g. creative thinking and ethical behaviour of an environmental nature) and functional - 'hard' competences (e.g. economical use of raw materials, waste segregation, energy-efficient driving skills) (Kozar, 2017).

Selected examples of green competencies


Based on the climate change studies quoted, it can be concluded that modern organisations have to increasingly take into account different types of risk (including climate change risk). Specialists are therefore needed who are competent in risk management, but they must also be equipped with knowledge of technology, environmental basics, physics, chemistry.

Mathematicians with skills in creating different models, scenarios will be useful - in a special way.



The change in the training profile should concern specialists in crop production. There is no doubt that new crop technologies are needed (e.g. even more drought- and heat-resistant crops). Here, knowledge of quality chains, process engineering is needed.

The training of management professionals must be oriented towards interdisciplinarity. Economic, managerial knowledge alone is absolutely insufficient. A good quality or process management specialist must have extensive technical knowledge. Without process knowledge, it is hardly feasible to improve processes - especially if we are thinking about reducing negative environmental impacts.

Soft skills will still be important - as the importance of teamwork, bringing together specialists from different fields, is increasing. It goes without saying that the competence of HR professionals cannot be limited to knowledge of recruitment, motivation, training and appraisal processes (insofar as this is relevant). Such people must have knowledge of psychology, sociology and especially knowledge of environmental behaviour. They must know how to diagnose and shape these behaviours.



Based on the data published in the Climate Report (The Economist), it can be assumed that managerial competencies are needed regarding:

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- environmental risk assessment,
 - environmental legal requirements and the operation of companies,
 - assessing how customer preferences are changing,
 - green supply chain management.

Risk assessment has always been an important competence not only in the circular economy. In this case, however, it is about managers being aware of climate risks. As is well known, changing climatic conditions are the cause of floods, heat waves, forest fires.

In 1997, no one took into account what happened in southern Poland. Significant stock exchange companies found themselves underwater. For example, in Zakłady Elektrod Węglowych S.A there was an explosion of the large graphitisation furnaces. The water flooded the machinery park, destroyed the stored raw materials (including precious anthracite) and the entire production. The losses were enormous. They included technological and social potential. In fixed assets alone, losses were estimated at 24.5 million PLN (Bugdol, 2010).

Climate disasters disrupt production, supply chains and make it impossible to ensure what we pompously call business continuity. So when we talk about risk management, we are referring to the process of decision-making aimed at mitigating risk, which is done on the basis of management competence. It can be based on data analysis as well as on their own intuition. Important in this process are the values held and the response to risk (Radu and Lungu, 2017).


Until the 1960s, many organisations were not concerned about negative environmental impacts. At the time, there was no talk of environmental risk. Even in the 2004 environmental management standard ISO 14001, there was no criterion referring explicitly to this risk. The standard did, however, indicate the need for preventive action, and organisations - through operational control and emergency preparedness and response procedures - were significantly reducing environmental risks (Del Brio et al., 2001).

The term environmental risk itself is very broad and should be looked at from a broader perspective, i.e. causes and consequences. These risks are strongly linked to: financial risks (lack of appropriate safeguards leads to increased fines and costs), image risks (the organisation being perceived as a polluter), personal risks (lack of appropriate action leads to loss of life or health, and dangerous, anti-environmental behaviour is the source of many other dangers).


The second important task is to identify legal requirements. It is important for managers to be aware that their operations, but also their development plans, must comply with all environmental regulations (and there is a growing number of these).

The aim should therefore be to ensure that future managers are competent in identifying and interpreting legal requirements and that they are able to implement them quickly.


There is no business without customers, but while companies strive for customer satisfaction surveys, they do not always take care to get to know their customers' needs (sometimes these needs are created in a very unethical way). The importance of organic products is also increasing. Not only do customers want to purchase what



is safe for the environment, but they also want to be convinced that these products have been produced in an ethical way that does not have a negative impact on the environment. Our environmental awareness is growing and consumer behaviour is changing (cf. Suki,2013).



At the same time, various periodicals report that in many countries there is shame about buying or consuming products that are unnecessary.



Therefore, competence in marketing research methods and techniques (especially with a focus on “green marketing”) is so important (cf. Haq et al.,2021).

In practice, there are many ways of obtaining data. Their source may be the results of market research (carried out by the organisation itself or by other entities), records of canvassing trips and trips to international fairs, reports from customer satisfaction assessments (especially if they were carried out directly at the customer - the user of various products), reports from surveys carried out by business and trade intelligence agencies, scientific articles, etc. Today, the problem is an excess of knowledge, of unverified information - hence the need to train specialists in data analysis, data processing.

One of the competences already highly needed is the ability to manage a green supply chain. Various publications highlight that companies are increasingly attaching importance to recycling, reusing and reproduction, changing their production and distribution strategies to make more efficient use of the natural resources they obtain from the environment. As a result of growing concerns about environmental issues in recent years, interest in environmental social responsibility and green supply chain management practices has increased significantly. This management plays a key role in helping companies gain a competitive advantage and improve their environmental image. Effective practices can help organisations reduce cash flow time, minimise risk, increase profits and ensure revenue predictability (cf.e.g. Yangınlar, et al.,2022).

Competences for shaping pro-environmental behaviour will play a very important role.

Pro-environmental behaviour “includes minimising the use of natural resources as well as harmful and toxic substances, reducing waste generation and energy consumption. They are conscious actions to reduce the negative impact of humans on the environment” (Kollmuss and Agyeman, 2002, p.240).



Pro-environmental behaviour has various manifestations. For example, with regard to residents, these manifestations could be recycling, household water conservation, not littering, support for environmental associations.

As for employees, signs of such behaviour include: taking care to save water, electricity, proposing new technical solutions to benefit the environment, educating other employees.


In the case of managers, it is a very important task to set an example to others by their own behaviour.

“A new director has been hired in one of the companies belonging to the chemical industry. Contrary to expectations, there were no major changes in management processes in the organisation. The new director was a calm, composed person, he did not shout, he did not punish, he collected cigarette butts, plastic bottles, he threw the rubbish into the rubbish bin himself and segregated different waste. When the workers saw how their new director acted, they began to feel ashamed. Gradually, they began to change their habits. After a few weeks, there was no more rubbish in their organisation” (Bugdol, Puciato 2022, p.20).

There are many factors influencing pro-environmental behaviour. Important factors include: professed values,



personal and group norms and awareness of consequences, intrinsic motivation, individual beliefs, faith, religion, personal connection to nature, health consciousness, feelings of guilt, ways of thinking and acting characterised by inconsistencies in applied moral principles, knowledge, public opinion, and the organisational climate in the workplace (cf. Bugdol, Szklarczyk, 2022).



Some companies are using rather controversial methods to shape pro-environmental behaviour. For example, San Francisco-based clothing company Esprit de Corp. has used surveillance footage showing recyclables going into bins under the cover of darkness. The broadcast of a video showing inappropriate behaviour by employees causes embarrassment, anger and guilt (One way to spread ...,2008).

But it is better to educate people, to support people, to show positive examples of environmentally friendly behaviour, to make people realise that they are part of what we call the environment.

Another important competence is the efficient management of various pro-environmental systems and concepts.

Companies can apply for certification of environmental or energy management systems, but they can also greatly expand their own environmental requirements by adopting more holistic solutions, such as Total Quality Environmental Management (TQEM). This concept requires leaders to recognise environmental aspects in every process and in every area of the company. They must have clear goals, a roadmap and a clear model for achieving excellence in the area of environmental management (Jayathirtha, 2001).


The main objective of TQEM is to reduce the negative impact of the organisation (its activities) on the environment. This is achieved through:

- reducing waste with continuous improvement of the organisation in this area, leading to cost reduction,
- reducing the demand for resources,
- eliminating pollution,
- designing products with minimal environmental impact at every stage of their existence,
- control of the environmental impact of new products,
- promotion of pro-environmental behaviour among employees and society (Bugdol, Puciato,2021).

The modern manager must have knowledge of sociology, psychology, economics, but also technology. It is very important to look at the organisation holistically, to think systemically - that is, to know how changes in one system (e.g. the organisational structure) affect other systems (e.g. people's behaviour). It is important to think in terms of processes rather than functions. Without such knowledge, the ability to improve various technological, managerial processes is not possible.

As for environmental management systems, they customarily require from employees, but especially from managers, competences concerning:

- formulation of environmental policy,
 - management of environmental objectives (linking these objectives to strategy),
 - integrating the requirements of the environmental management system with other management systems
 - social communication (it is important to inform employees about the level of achievement of objectives),
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- analysing processes in terms of risks, opportunities for improvement, identification of environmental aspects,
 - support employees who have an influence on the effectiveness of the environmental management system,
 - promote and support continuous improvement (e.g. sensitising employee suggestion schemes) (cf. EN ISO 14001: 2015. Environmental management systems).

Every employee, regardless of their function, must:

- know the environmental aspects and their sources,
- know how to deal with environmental accidents and disasters,
- be able to interpret data on environmental effects and process records,
- know the environmental objectives and the factors that influence their achievement,
- have assigned responsibilities but also authority,
- know the consequences of deviating from accepted environmental standards,
- know the existing technology to the extent that corrective and preventive actions can be reported.

In the implementation of the objectives and their setting, as well as their modification, the capabilities and competences of the employees must be taken into account. Of course, it would be ideal for these goals to be set on a participatory basis so that they gain full acceptance. In management, it is assumed, employee participation in goal setting leads to higher levels of performance (Slattery and Ganster, 2002).

Whether we are dealing with environmental management systems or energy management systems, an important skill that managers need to have is to provide support to others. When I speak of support, I am not only referring to appropriate organisational forms - i.e., for example, procedures defining how ideas are put forward and dealt with, but support consisting of the transfer of relevant knowledge (cf. e.g. Afshar Jahanshahi et al., 2022).

This is why we should be confronted all the time with the need for continuing education professionals.

Management is not about supervising, but about expressing respect for others, supporting them in their various tasks, but also in their social roles.

Any competence related to human resource management will be important (Bugdol and Stańczyk, 2021).

Green human resource management refers to a set of practices that organisations adopt to improve environmental performance (e.g. improving environmental aspects, improving environmental awareness and behaviour). It has become a key business strategy for many organisations because HRM practitioners can play a key role in driving environmental improvement (Hameed, et al. 2022).

It is widely accepted that this green management should help employees meet environmental goals.

Green management can, under certain conditions:

- play an important role in creating awareness among employees,
 - foster civic behaviour in the workplace (i.e. voluntary, above-standard),
 - provide a competitive advantage in the labour market,
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- shape a positive corporate image,
- contribute to economic and environmental efficiency (Bugdol and Stańczyk, 2021).

Within management practice, green recruitment and selection, green motivation, adaptation, green training and development, green management and performance appraisal, green remuneration and motivation are mentioned most frequently.

Management should therefore be competent in terms of people management, which promotes the achievement of environmental objectives, ensures less consumption of resources and guarantees the supply of safe and environmentally friendly products to the market.

Already at the stage of hiring employees, it is important to assess their competence (for example, how knowledgeable they are about the operation of environmental management systems), their ability to carry out process analysis, improve operations, conduct management reviews or environmental audits.

During adaptation, the employee should:

- have opportunities to familiarise themselves with the whole organisation, receive training on environmental management,
- be familiar with environmental standards and requirements,
- participate as an observer in at least one environmental audit,
- be familiar with all environmental aspects and where they occur,
- be familiar with procedures for dealing with accidents and environmentally hazardous situations.

As far as training is concerned, it is important to bear in mind that the outcome does not always lead to practical action. Training cannot change our certain established behaviour, but it is one element of creating pro-environmental awareness (cf. e.g. Taylor et al., 2005).

Motivation is not just about respect and a congratulatory letter, it is about ensuring that employees are involved in setting targets, and that they share in the financial benefits generated (for example, from reduced raw materials, reduced fines or environmental charges).

It is a very controversial idea to reward employees and especially managers for meeting environmental targets. Remuneration for meeting environmental objectives can be a cause of limiting the process of minimising negative environmental impacts (especially if the system is not progressive and the remuneration applies only to top management) (Bugdol and Wontorczyk, 2021).

Summary

Examples of suggested competency areas are included in the table below.

Specialists	Managers	Employees - all
Environmental risk management	Identification and interpretation of legal requirements	Knowledge of policy, environmental objectives, environmental aspects and their sources

Wdrażanie różnych zielonych technologii, programów (w tym infrastrukturalnych, marketingowych i innych)	Knowledge of systems for managing energy and the environment, EMAS, TQEM	Knowledge of the consequences of deviating from accepted environmental standards and requirements
Green people management	Business continuity management	Ability to interpret data on environmental effects and process records
Shaping pro-environmental behaviour	External context analysis	Knowledge of environmental procedures (including emergency and environmental disaster management)
Green supply chain management	Creating investment plans that take environmental performance into account	Demonstration of passive and active pro-environmental behaviour
Ability to create different models, scenarios	Developing green strategies	Active participation in taking corrective and preventive action
Active participation in suggestion and innovation programmes	Environmental policy formulation and management of environmental objectives (linking these objectives to the strategy)	Basic knowledge of environmental and energy management systems
Active participation in the implementation of green lean	Familiarity with concepts such as green marketing, machines, buildings	
	Green lean process management	

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