ORDRE DES INGÉNIEURS DU QUÉBEC

NOVEMBER 2023 SESSION

Open-book examination
Calculators : only authorized models
Duration : 3 hours

23-EC-3 SUSTAINABILITY, ENGINEERING AND THE ENVIRONMENT

Secton I - THEORETICAL KNOWLEDGE (50%)

Ia) **Biomimicry in Engineering and Biomimicry Design (25%)**

Nature as a model. Biomimetic design is a relatively new eco-innovation approach in engineering guided by ISO 18458.

1) Describe biomimicry in a few lines: What it is, its origins, its use in engineering, the main principles found in sustainable ecosystems. (12%).

2) Describe the main steps or the sequence to follow for a biomimetic design process. (13%).

I b) **Circular Economy (CE) (25%)**

An alternative to the linear economic model

1) Define the circular economy (5%)

2) Present two circular economy tools, approaches or components that make it possible to operationalize this concept, particularly in engineering. (20%) - 1 page MAXIMUM

Section II - PUTTING TOOLS FOR SUSTAINABLE ENGINEERING INTO PRACTICE (50%)

II a) BNQ 21000 (25%)

You want to assess your company's positioning in terms of SD and for this, you have chosen to use the BNQ 21000 approach (Tools and standard). You know, among other things, that the self-assessment grids of the BNQ21000 toolbox, available online, are used to summarily assess the sustainable development practices of an organization. This is a good starting point to paint a picture of the state of the situation, and define an action plan in SD / Corporate Social Responsibility. These grids will allow you to obtain the information necessary to begin a process of continuous improvement to progress in a perspective of sustainable development.

1) Present the BNQ 21000 approach: objectives, what is BNQ 21000? (5%) - in 5 lines MAXIMUM

2) What are the main themes covered by the self-assessment grids of the BNQ 21000 approach (5%)?

3) By illustrating your answer using information from the BNQ 21000 table D1 cross-cutting thematic grid presented below (15%):

> ***a) Present two issues of this theme (5%)***
>
> ***b) Present the use or usefulness of this grid to achieve your objective of evaluating your company's SD positioning. (10%)***

Theme and Issue	Description	Level 1	Level 2	Level 3	Level 4	Level 5
1.1 Vision, Mission and Values	*For the organization, the vision describes what it would like to be the ideal for the future. It is a source of timeless inspiration and provides clear benchmarks to support decision-making. The mission of an organization is a general statement that describes the "raison d'être"–its market, its product–and frames discussions on strategic choices. Values guide the attitudes and the behaviours of all collaborators of the organization.*	The vision, the mission and the organizational values are not clearly defined.	The vision, the mission and the organizational values are partly defined and are fragmentarily reflected in the organization's management without addressing issues related to sustainable development.	The vision, the mission and the values are clearly defined in a founding document and are reflected in the organization's planning and management. The documentation presents a resulting first reflection on the challenges of sustainable development by incorporating some principles.	The vision, the mission and the organizational values incorporate the principles of sustainable development. The organization ensures that these principles are reiterated in other organizational documents with ethical content (code of ethics, organizational policies, sustainable development report). The organization initiates a reflection on the interests and concerns of the stakeholders related to the organization.	The principles of sustainable development permeate in the organization's vision, mission and organizational values. The organization assumes its responsibilities towards stakeholders and is an inspirational source to society in general.
1.2 Organizational Strategy	*Strategy is the fundamental frame of reference from which an organization can maintain continuity while voluntarily managing its adaptation to a changing environment in order to have a competitive advantage* (Hax [see Annex H]).	The organizational strategy is not clearly defined.	The organizational strategy is updated periodically following exceptional external events.	The organizational strategy is formalized and periodically stated in objectives, dashboards, and in short- and medium-term indicators.	As part of its thinking for seeking a competitive advantage, the organization integrates in its strategy the objectives and stakes that are in line with the sustainable development.	Sustainable development is the core element around which the organizational strategy is built.
1.3 Business Ethics	*Business ethics cover several interrelated levels: the organization's work, the politico-geographical context in which it operates, the moral quality of the transaction types and of the organization's business environment.*	The organization has no document describing its organizational ethics (e.g. code of ethics, code of conduct) or has not yet initiated reflection on this matter.	The organization has a document describing its organizational ethics, but its content reflects current laws and regulations only. However, this document has little influence on the organization's decisions.	The organization has a code of conduct and a defined organizational ethics that, together, strive to stimulate all members of the organization to adopt a more ethical behaviour (management of issues of conflict of interest, corruption). The organization is committed to compliance with international commitments and treaties (Universal Declaration of Human Rights, the principles of the ILO, United Nations Global Compact, etc.).	The organization ensures that the document describing its code of ethics is a "living document." It is reviewed periodically to ensure its consistency with stakeholder expectations and with other founding documents of its organizational culture (e.g. mission/vision/values, code of ethics, organizational policies, sustainable development reports).	The organization makes ethics a constant concern in all its activities, operations, decision-making processes and in its relationships with stakeholders. It shows great awareness of its economic, environmental, social and moral responsibilities towards society.

Theme and Issue	Description	Level 1	Level 2	Level 3	Level 4	Level 5
1.4 Responsibility with regard to Products and Services	*Responsibility with regard to products and services is the organization's commitment, on the one hand, to design quality products and services that minimize the consumption of resources as well as the negative impacts on the environment, on the health and safety of the community, its workers and its customers, and on the other hand, to ensure a transparent communication that is ethical and respectful of the rights to information (access and privacy) of its stakeholders.*	The organization has no structure that identifies or monitors client satisfaction with respect to the quality and safety of its products and services. For example, it does not have a system to manage and monitor complaints or returns on products or services. Complaints and returns are merely processed individually.	The organization has a few management practices that strive to better understand client needs. For example, it has a simple management system to process and monitor complaints or returns of products or services. In recurring cases, measures are taken on an ad hoc basis to ensure it does not happen again.	The organization has an organized quality management system to monitor complaints and returns in all its forms (e.g. ISO 9001 [see Annex G] or other). A non-compliance review of returns is conducted periodically. Also, clear policies govern the implementation of guarantees. The organization seeks to make its products eco-efficient; however, a lack of expertise slows down the process.	The organization knows the impact of its products or services life cycle on the environment, the community and the health and safety of its clients. Concrete, responsible and sustainable actions are carried out by the organization (e.g. eco-design [from cradle to cradle]). Client satisfaction and impact studies are conducted periodically.	The organization has integrated the principles of eco-design in all its products and services. It is transparent in pricing and in communications. Through experience sharing, it participates in discussions on management with its business activity sector and the community.
1.5 Governance	*The governance of the organization is a set of laws, regulations or practices that define the boundaries of research and development authority from the responsibilities of those who are in charge of sustainably guiding the organization. Guiding the organization means making and managing decisions that have a decisive effect on its sustainability and thus on its sustainable performance (Gomez [see Annex H]).*	Information on the composition as well as the appointment procedures of governing body members are non-existent. The organization has no independent members on its board (board of directors or advisory board). Generally, decisions are made by limiting the advisory process.	Information on the composition as well as the appointment procedures of governing body members are not disclosed. Depending on the importance of governance-related decisions, the organization calls on external consultants on an ad hoc basis.	Information on the composition as well as the appointment procedures of governing body members are clearly defined. The organization has a board (board of directors or advisory board) that meets regularly.	The organization adopts "best practices" of governance and initiatives that go beyond the requirements contained in the codes of conduct. It has a board (board of directors or advisory board) comprising one or more independent members. The organization advocates transparency and demonstrates a genuine desire to reconcile the interests of all stakeholders in decision-making. It sets up consultation arrangements and control mechanisms that allow for accountability.	The organization puts forward a genuine culture of governance. For example, it has a board (board of directors or advisory board) predominantly made up of independent members. The leaders conduct themselves in a manner that is consistent with the organization's mission and values. This culture operationalizes itself through consultation arrangements, fora to reconcile conflicting interests of stakeholders and through mechanisms that strive for an equitable sharing of added value. In short, it acts with transparency and integrity towards society.

II b) **<u>Climate and adaptation (25%)</u>**

Climate hazards have materialized more concretely in recent years: forest fires, floods, tornadoes, droughts follow one another all over the planet.

Based on your knowledge and your preparatory reading presented in the exam bibliography, suggest avenues to explore so that Quebec can meet its commitments in terms of reducing greenhouse gas (GHG) emissions. 1 page Maximum

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