Green IT Fundamentals

Introduction

- This chapter focuses on the assets of an organization from the point of view of their impact on the overall carbon contribution of the organization.
- While these assets have been grouped from an accounting perspective in tangible and intangible assets, it is worth grouping them into two groups from a carbon perspective: the static, infrastructural assets (e.g., the data center) and the nonstatic assets (which are mobile, such as a laptop computer) of the organization.
- These assets impact the carbon footprint of the organization right from their procurement and installation through to their disposal.

- Eventually, astute carbon management of these assets results in reduced carbon footprints that can be exchanged, traded, and used to increase the value of the organization, its products, and services.
- The static, infrastructural aspect of an organization requires separate, special attention.
- The long-term strategies of the business in terms of ownership, design, procurement, operation, and disposal of these infrastructure assets all affect its carbon footprint. This is so because the infrastructure has a one-off decision-making point at the time such as when it is procured and/or constructed.

- After that initial decision-making process is consummated and an asset has been procured, the only way its carbon impact can be reduced is through optimized operation. However, the upfront decisions, when a static, structural asset is being procured or constructed, have a much longer and strategic impact on the overall carbon footprint of the organization than when that asset is in operation. Therefore, the practices of procurement and construction gain immediate importance in the discussions on Green IT.
- Similarly, special attention is required when an asset is disposed off . This is so because when it gets removed from the asset register of an organization, it may not generate the carbon emission it used to generate during operation. This may create a false impression that the asset is no longer the organization's responsibility.

- However, has that electronic (typically computer) asset been ethically disposed off ? Or is the lead from a desktop box or laptop battery leaking into the water supplies of a community? How are its parts being dismantled?
- Ethical disposal of electronic waste can cost multiple times (some estimates range from 10 to 20 times) in a fully developed country than in a developing nation—primarily due to availability of cheap labor
- These costs need to be factored in the overall green strategies of the organization. This chapter gets deeper into these organizational practices associated with the assets and infrastructure of the organization.

Green Assets

- The green assets and infrastructure comprise substantial part of the long-term approach to managing the carbon performance of the organization.
- Figure 4.2 depicts examples of these enterprise infrastructure assets (both movable and nonmovable) on the left
- On the right side, in Figure 4.2, the three major phases or activities associated with the lifecycle of these assets is depicted: the way they are established or procured, the manner in which they are operated or run, and eventually the strategies for their disposal or demolishment.

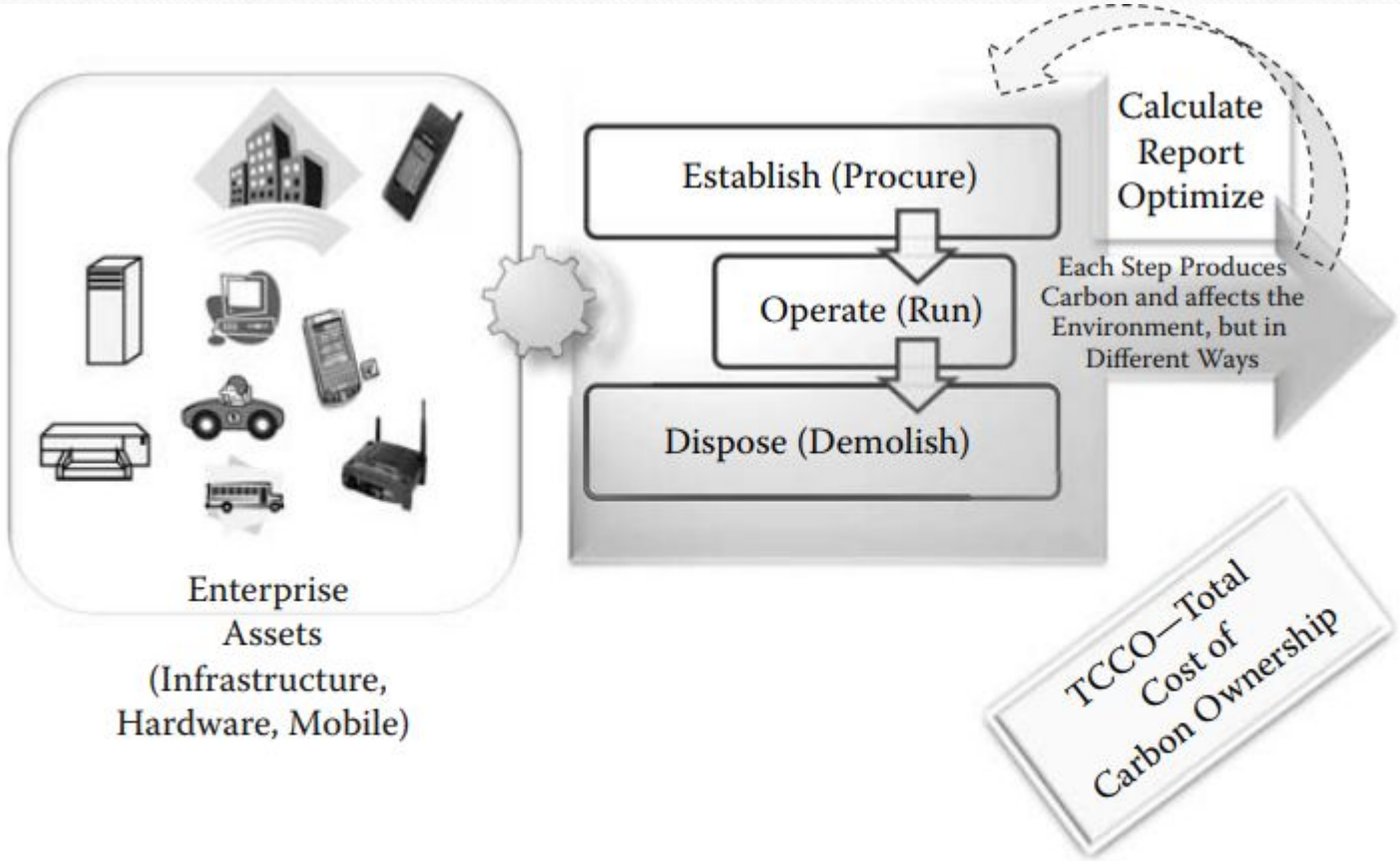

Figure 4.2 Green assets need to be organized in an efficient way throughout their lifecycle.

- Each of these three major activities relating to the infrastructure assets has the following carbon repercussions.
  - Establish (Procure) deals with the green credentials of the asset in terms of its design and development. This is a one-off decision-making process that decides on the carbon efficiency of that assets design. For example, the original design of a car engine or a mobile phone that make it carbon efficient. This is a one-off factor when an organization is procuring the asset. Similarly, in case of buildings, the one-off factor that comes into play has to do with its architecture and design

- Operate (Run): The manner of operation of the asset has a bearing on the total carbon contribution of the organization. Length of operation of the asset, such as operating a vehicle for 10 years or a mobile phone for 2 years will impact the overall emissions of that asset over its lifetime. The user of the asset is responsible for operating (using) it in such a way as to reduce its carbon impact. Thus, this is an ongoing, daily decision-making process.

- Dispose (Demolish): This is the eventual phase of a n asset and it also impacts t he overall carbon footprint of an organization. This impact is through the organization's approach to disposing or demolishing the asset. This is also a o ne time decision-making process with long-term effect on the environment. For example, ethical disposal or desktop and laptops are a major domain for discussion and action—especially within medium to large organizations, wherein policies might dictate the end of use of an asset rather than its actual dysfunctionality. Therefore, policies for recycling of assets that are beyond the "use by" date for the organization need to b e studied and revised to ensure that the assets are disposed ethically and with least impact on the environment. Such revision of policies will also open up opportunities for reuse and recycling

- This is the Green Procurement-Operation-Disposal (P-O-D) lifecycle of an assets. Figure 4.2 also highlights the fact that each step of P-O-D produces carbon that affects the Total Carbon Cost of Ownership (TCCO) of that asset. Thus, assets need to be considered in the context of not just their current costs, but their TCCO. The concept of Total Cost of Ownership (TCO) for ICT equipment w as made popular by re search consultancy Gartner
- TCO, as its name suggests, is based on the full cost of equipment over its entire life, not just the purchase price. It takes into account running costs, maintenance, upgrades, and so on.
- For computing equipment, it is reasonable to expect their TCO to exceed the original purchase price by a factor of three or more.

- Therefore, counting the total carbon costs over the lifetime of an asset including its carbon content in production, the carbon generated during its operation over its lifetime and the carbon produced in its disposal, is vital.
- Until recently many TCO computations have not taken into account the costs of the power to run the ICT equipment. This is so, because power costs have been comparatively low, and because ICT departments and users are rarely billed separately for the electricity they consume and have no visibility of it. However, when the TCCO calculations are made, it becomes important to incorporate the carbon that is generated along with the calculations of costs associated with equipment. TCCO can be improved with smart metering capabilities, carbon calculations throughout the life of the equipment and its disposal. Since the power consumption of data centers is rising, so is the heat generated by data center processors. TCCO has to also include the power involved in the effort for cooling.

Types of Assets (Categories) and Their Impact on the Environment

Type of Assets	Impact on Environment
Buildings and Facilities (e.g., offices, meeting rooms, training centers, social rooms, sports facilities)	Long-term impact as major environmental considerations should be during architecture and construction. Purpose of buildings, people movements, geographical locations (weather), and durability of the building impact their overall carbon contribution. Examples of one-off decision making in design include the materials used in the construction, the extent to which the building is facing the sun, the wind directions, and the way in which these natural light and natural cooling are put together to reduce energy consumption.

Cont…

Type of Assets	Impact on Environment
Data Center (as separate, dedicated buildings to house servers)	This is a special purpose building to house data servers. In addition to the standard building considerations, the ratio between power usage by the servers versus the rest of the power is a popular environmental consideration. CRAC (Computer Room Air Conditioning) is a discipline in its own right that separates the cooling of the servers from the air conditioning required in rest of the building. Thus, building technologies together with data server technologies are put to use here to reduce carbon.

Cont…

Type of Assets	Impact on Environment
Devices (e.g., laptop, mobiles)	Design, development, procurement, operation, and usage of devices is considered here. Example of this includes low-power consuming design for laptops and mobile devices, efficient batteries for them, carbon-conscious electronic chip design, biodegradability of materials used, and so on. Apart from the operational carbon generated by these devices, their disposal itself is an important issue.

Cont…

Type of Assets	Impact on Environment
Vehicles (e.g., cars, trucks, corporate vans, and buses)	Direct fuel emissions, pollution level of the type of fuel, design of the engines, and so on. Procurement, operations and disposal activities apply to vehicles used by the organization. These vehicles produce the Scope 1 emissions. Fleet maintenance systems need to be updated with carbon calculations. The kind of vehicle, its design, how long it will be operated, and the method of its disposal has to be considered. Vehicle emission consideration is vital when considering the entire organization. This table lists vehicles as an important reminder

Building and Facility Management

The physical buildings and facilities belonging to the organization form the crux of its nonmovable assets. Buildings, while usually not a part of IT directly, are still a major contributor to the organization's carbon footprint. This carbon generation from buildings, as described briefly in Table depends on the material of the building itself, its air conditioning, and related operational features such as lighting and ventilation. The architecture and design of the buildings used by businesses impact the long-term carbon generated by them. While most contemporary focus of Green IT has been on the operational aspect of these facilities, the architecture and design of offices, factories, and related facilities (such as, a sporting complex or a community room) have a strategic role to play in the organization's carbon footprint.

The need and demand to consider the carbon issues upfront, during initial procurement and/or construction of buildings and facilities and subsequently focusing on its optimized operations is crucial to t he holistic approach to a green enterprise. This forces the construction industry to handle issues such as the type of insulation used, facilities to recycle water, and the use of natural light in determining the TCCO for that building. These factors would affect indirectly or directly on every previous step taken into consideration. For example, the location of an operational room, where staff is ideally located, should have natural and sufficient sunlight during daytime that would reduce electricity usage.

Use of translucent materials for dividers, focus on solar charging, and use of solar equipment and cells are all examples of strategic aspects of environmental asset management. When applied specifically to buildings, these considerations fall under the category of green facilities management that has capabilities to show significant savings on a long-term basis. In addition to the office buildings and relevant manufacturing facilities, when it comes to buildings that house the data centers of large organizations, the entire perspective on their carbon productions shifts to being IT specific. Therefore, the data center aspect of Green IT relates to both building management and IT management. Due to its importance and its impact on the overall green credentials of the organization, the management of data centers needs to be discussed separately

Green IT Hardware

The hardware aspect of Green IT deals with the architecture and design of IT hardware, the way it is procured and operated. While operational energy consumption is increasingly an important issue for computer manufacturers, what is even more interesting is the impact a good, energy optimum design can have on the overall energy consumed by a piece of hardware over its entire life.

A purpose-built computer chip, or an efficient laptop battery design has potentially greater impact in reducing carbon emissions over its lifetime than its operation would have.

Building Features	Environmental Relevance	Comments and Actions
Location	Use of geographically specific natural resources such as cool weather, natural sunlight.	Locating a data center in Iceland can reduce the cooling costs, effort and corresponding carbon.
Architecture and design	To maximize the use of available natural resources for the building.	Windows facing sunlight; cross-ventilation; air and water cooling of data centers.
Construction	Use of material (concrete, carpets, terracotta) to compliment the location and design to ensure that the material reduces wastage and maximizes natural resources.	Use terracotta roof instead of concrete.

Building Features	Environmental Relevance	Comments and Actions
Livability (occupancy)	People friendliness of the building/ facility that has health as well as aesthetic benefits.	Optimizes the way in which people use the facilities. A naturally lit, cheerful building will need less power.
Visibility	Promoting the physical building as a place of attraction adds marketing value, as also improved asset value.	Ivy's climbing on the walls. Terrace gardens.