BIRZEIT UNIVERSITY

Developing an Environmental Management System for Birzeit University

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ABSTRACT

Improving the environmental performance of universities is being an important issue recently in the world, in a way of limiting environmental damage. Environmental management system (EMS) provides a suitable framework for universities that wish to effectively manage their environmental affairs. Environmental management involves setting goals and objectives, allocating and organizing resources, assessing results, and providing feedback. It is an interactive process which focuses on continual improvement and can reward universities by: improving compliance with regulatory requirements, decreasing costs, increasing communication between units within the university, and assisting in the identification and minimization of adverse environmental impacts and risks.

This study aims to introduce environmental management system as an effective tool to manage the environmental activities at Birzeit University. By developing an environmental policy as an initial step to develop the EMS.

A review for the existing environmental activities was done to make a group of the main environmental categories at BZU. Also a questionnaire was distributed for BZU community (employees and students) in order to explore the relationship, awareness, and acceptance to develop an EMS.

The results for this research showed that there is a relationship between the increase in the numbers of students and employees and consequently the number of buildings, and the environmental activities at the university and the increase in consumption. Results of questionnaire showed that there is a relationship between BZU community and the visible environmental activities, BZU employees have the awareness of environmental issues more than students, finally, more than 90% of BZU community accepted and committed to have an environmental policy as a first step in order to develop an EMS.

A suggested EMS for BZU was developed in addition to a detailed managing and technical levels, that could help the university to manage its environmental activities in a way that can reduce the negative impacts on its environment, as a step to support developing the EMS.

The recommendations of this study were to focus on environmental issues besides academic goals, to develop an environmental office in BZU, to develop an environmental policy for BZU, to develop an EMS of level two, to apply suggested managing and technical methods and finally, BZU can change the values and attitudes of its community into better understanding for environment, and consequently that can affect the society.

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List of Abbreviations

AC	Academic Employees
AD	Administrative Employees
BLDG	Building
BZU	Birzeit University
CRT	Cathode Ray Tube
EH&S	Environmental Health and Safety
EMR	Environmental Management Representative
EMS	Environmental Management System
EPA	U.S. Environmental Protection Agency
HVAC	Heating, Ventilation and Air Conditioning
ISO	International Organization of Standardization
JDECO	Jerusalem District Electricity Company
LCD	liquid Crystal Display
MEnA	Ministry of Environmental Affairs
SHWEC	Solid and Hazardous Waste Education Center
SPSS	Statistical Package for Social Sciences
UNC	University of North Carolina
UK	United Kingdom
US	United States
VFD	Variable frequency drives
WWTP	Wastewater Treatment Plant

Chapter One
Introduction

1.1 Background

In the past decades many organizations, both in the private and the public sectors, have recognized the value of a systematic approach to the management of their organizations. This approach basically ensures that their management processes are linked together in a logical structure (Lexington, 2001). An important issue that many organizations are focusing is the environment. The environment has become an important factor in the decision-making process around the world; where reducing pollution means increasing efficiency and wasting fewer resources. Improved health and safety conditions result in a more productive workforce. On the other hand, the risks posed by mismanaging environmental issues are complex and varied. They include the obvious, such as damage to the environment with negative consequences for the overall standard of living

Universities, as institutional organizations, have a responsibility towards improving their environmental issues performance. By developing an environmental policy as the first step in order to adopt an environmental management system any university, large or small, can ensure that it effectively manages environmental risks while identifying and exploiting the myriad opportunities proper environmental management can bring. Such a systematic approach to environmental management is at the very heart of the ISO 14001 standard Employing environmental management systems can help institutions address campus environmental impacts by providing a structure for assessing and improving the sustainability of all facets of campus operations (Keniry, 2003).

Many universities around the world adopted environmental management systems, and some got the ISO 14001 certificate. Unfortunately, there is a little knowledge about the environmental management system in Arab universities.

Birzeit University (BZU) as a leading university in the Palestinian society has the potential to have a successful environmental management system in order to be an example to develop the environmental sector in Palestine. By adopting an environmental policy, BZU

can be the first university in Palestine and in the Middle East to step toward developing an environmental management system.

1.2 About Birzeit University

BZU is the first institution of higher education to be established in Palestine since 1924. In addition to providing students with the opportunity to realize their academic aspirations, the University encourages its students to be productive citizens and active members of their community (BZU webpage).

The University plays a central role in developing the most valuable national resource in its society – namely the human one. New graduate and undergraduate programs in information technology, engineering, sciences, social policy, economics and management are being developed to assist in meeting this objective. The University campus is being expanded to better equip the University to meet the growing needs of higher education of the Palestinian society. At the same time, Birzeit University's various community Centers and Institutes continue to enhance and develop their work through intensive policy-oriented research to assist in the economic, social, environmental, and human development of Palestine .

1.2.1 Mission Statement

Birzeit University strives to promote excellence in higher education by providing quality academic teaching, training, research and relevant community programs within the context of sustainable development, emphasizing social conscience and democratic values in a free civil Palestinian society (BZU webpage).

1.2.2 Birzeit University Campus

The Campus is located on the outskirts of the West Bank town of Birzeit, about 20 kilometers (12.5 miles) north of Jerusalem and 7 kilometers (4.5 miles) north of Ramallah. The campus is approximately 80 hectares situated upon a hilltop that provides a panoramic view of the surrounding landscape (BZU webpage).

BZU has 17 buildings distributed within the campus, in addition to a residence of three buildings for employees and female students located at Birzeit town (Table 1.1).

Table 1.1 Main buildings in BZU

Building's Name	Total Area(all floors) m^2	Date of Establishment
Science Building	10260	1981
Omar Al-Aggad Engineering Building	12500	1984
Yusuf Ahmed Alghanim Library	4260	1985
Administration Building	2025	1985
Old Cafeteria's Building	1216	1985
Kamal Nasir Auditorium	1000	1985
Commerce and Economics Building	4500	1993
Engineering Workshops Building	1790	1995
Azeez Shaheen Clinic	633	1998
Institute of Law Building	1630	1998
Al Maktoum Building	4890	1999
Naseeb Azeez Shaheen Building	1507	2001
Physical Education Building	2768	2001
Maintenance Building	340	2001
Electricity Generators Buildings	185	2001
Library Annex	1868	2004
Institute of Women's Studies Building	1839	2004
Total	53211	

1.2.3 Distribution of the University

The following numbers indicate the distribution of the faculty and staff and students according to male-female distribution for the first semester of the 2005/2006 academic year (Table 1.2).

Table 1.2 Distribution of faculty, staff and students for 2005/2006 academic year

University Body	Female		Male		Total
	Number	%	Number	%	
Faculty	84	21%	322	79%	406
Staff	161	50%	158	50%	319
Students					
Arts	1312	70%	573	30%	1894
Commerce and Economy	653	52%	611	48%	1264
Sciences	644	59%	445	41%	1089
Engineering	414	29%	1024	71%	1438
Law	151	59%	103	41%	254
Special Programs	79	70%	34	30%	113
Graduate Students	471	47%	539	53%	1010
Diploma	21	64%	12	36%	33
Total Students	3754	53%	3341	47%	7095

1.2.4 Birzeit University Map

According to the engineering office, BZU map is as follows:

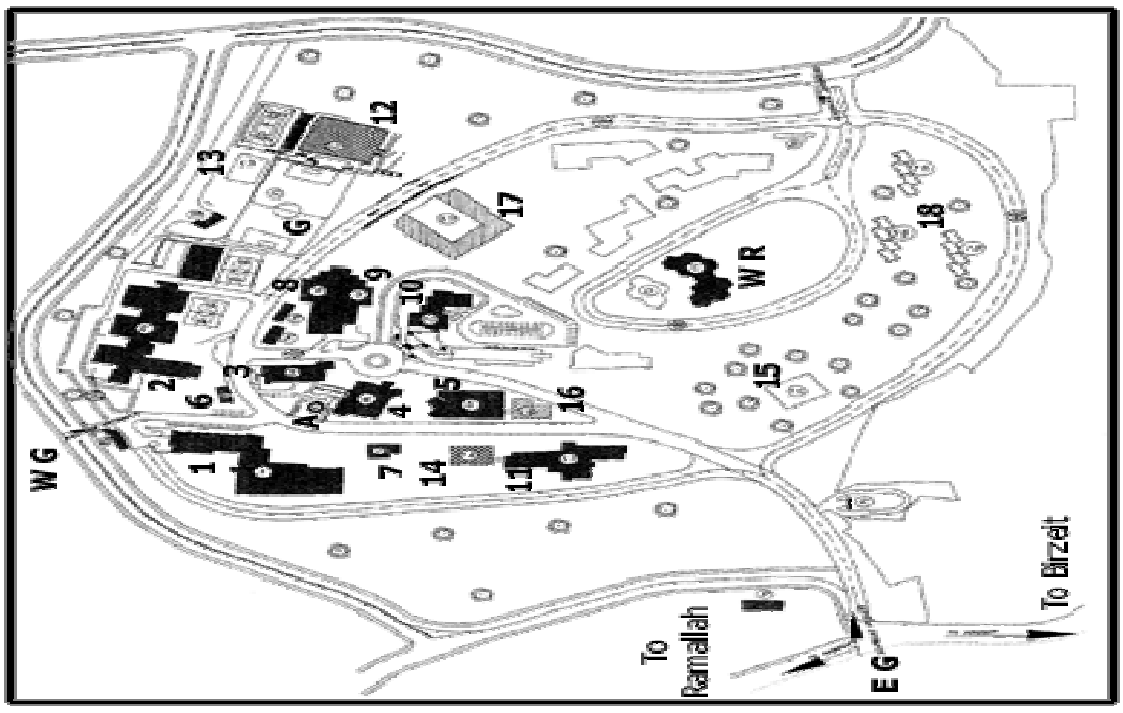

Figure 1.1 BZU map

According to the map there are existing buildings and planned ones, other buildings that are not numbered are sites for future facilities, the functions of which are not yet determined.

Table 1.3 Legend of BZU map

No	Building	No	Building
1	Science Building	13	Swimming Pool (Planned)
2	Omar Al-Aggad Engineering Building	14	Naseeb Shaheen Building
3	Administration Building	15	Education Institute (Planned)
4	Kamal Nasir Hall	16	Library Extension
5	Yusuf Ahmad Alghanim Main Library	17	Arts Building (Under construction)
6	Student Council Center	18	Student Dormitories (Planned)
7	Azeez Shaheen Clinic	A	Martyr's Memorial
8	Al Maktoum Building	WR	Water Reservoir
9	Diana Tamari Sabbagh Center	EG	Eastern Gate
10	Law Institute	WG	Western Gate
11	Commerce and Economics Building		
12	Gymnasium		

1.3 Goals and Objectives

The goals of the study are twofold:

- Developing an Environmental Policy for BZU as an essential first step to develop EMS.
- Introducing EMS as a tool to manage environmental issues at university.
- Developing a suggested EMS for BZU.

The specific objectives related to the goals of this research are:

- Provide a comprehensive review of EMS theory and requirements in the context of corporate environmental responsibility and sustainable development.
- Promote environmental education as an integral part of progressive environmental management.
- Explore materials and energy recovery options.

- Promote environmental hygiene methods to raise awareness on health issues within the university community.
- Raise awareness about environmental issues associated with universities.

1.4 Research Questions

The questions in this research strive to answer are:

- What are the environmental activities at BZU?
- Does BZU community relate to its environmental activities?
- Does BZU community have the awareness of environmental issues?
- Is there an acceptance to develop an environmental policy as a first step to develop EMS for BZU with emphasis on commitment?

1.5 Structure of the Thesis

Chapter two provides a review about the declarations that show the environmental responsibility for universities, motivations, benefits, levels, and requirements of EMS. Chapter three presents the main methodological approaches that were utilized. Results and discussion were presented in chapter four. The conclusion of the thesis was finalized in chapter five with the recommendations of the thesis.

Chapter Two

Literature Review

2.1 Declarations of Environmental Commitment

History shows that universities are willing to commit themselves to sustainable development environmental goals. Many declarations were signed and all address the role of universities in transforming to a sustainable society**,** where the educational, research and public service roles of the universities enable them to be competent, effective contributors to the major attitudinal and policy changes necessary for an environmental sustainable future. These declarations (Johnston, 2005) are:

- The Talloires Declaration
- The Halifax Declaration
- Earth Summit
- The Swansea Declaration
- The Kyoto Declaration
- The University Charter for Sustainable Development CRE-Copernicus Charter

All these declarations assured that universities can play a unique role to transform society to a post-modern environmentally and economically one. They encourage all universities; to engage in education, research, policy formation, and information exchange on population, environment, and development to move toward a sustainable future (Talloires, 1990).To increase environmental literacy, and to enhance the understanding of environmental ethics among faculty, students, and the public at large (Halifax, 1991). Increase public awareness (Earth Summit, 1992). To encourage universities to review their own operations to reflect best sustainable development practices (Swansea, 1993). To co-operate with one another and with all segments of society in the pursuit of practical and policy measures to achieve sustainable development (Kyoto, 1993). To commit themselves to an on-going process of informing, educating and mobilizing (CRE, 1994).

2.2 Environmental Management System

Part of an organization's management system used to develop and implement its environmental policy and manage its environmental aspects (ISO 14001, 2004).

An EMS is a formal set of procedures and policies that define - sometimes in great detail - how an organization will manage its potential impacts on the natural environment and on the health and welfare of the people who live in it (UNC, 2001).

EMS is a framework for understanding an organization's "environmental footprint," complying with environmental regulations, and implementing proactive pollution prevention strategies (U.S.EPA, 2001a).

2.2.1 ISO 14001

The International Organization of Standardization (ISO), located in Geneva, Switzerland, began developing a new series of standards called ISO 14000 during the early 1990's with input from member countries including the US. The complete set of ISO 14000 standards will deal with more than just EMS; for example, product registration, labeling, life cycle analysis and more. However, the first standard, ISO 14001, "The Environmental Management Standard", deals specifically with setting up an EMS (SHWEC, 2001).

2.2.2 Difference between EMS and ISO 14000

The major difference between just having an EMS and being registered to ISO 14001 is that ISO registrants must be 3rd party audited on a regular basis to ensure that all requirements of registration are met. This is accomplished by contracting with one of the many ISO Registrars available around the world. The cost of hiring a registrar and the fee for registration can be significant and has been a barrier to registering for smaller organizations (SHWEC, 2001).

2.2.3 Motivations for EMS Implementation in Universities

Implementing EMS in universities has more than one motivation; these motivations (Simkins, 2003) are:

- Better regulation of responsibilities and competencies.
- Reduced risk of legal penalties.
- A better relationship with the authorities.
- A positive image (so attracting students).
- Cost reduction.
- Improved personnel motivation.
- Delegation of tasks from professors, so that they may concentrate on research and teaching.
- The need to respond to a change in hazardous waste regulation.
- Provision of mechanisms for the communication of environmental efforts.
- The encouragement of departmental collaboration.
- Need for a structured system to assure that students received education on sustainable development.
- To act as a role model for other universities.

Although environmental performance improvement may be organized without a formal EMS structure, implementation provides a clear strategy for performance improvement which may otherwise be lacking (Simkins and Nolan, 2004).

2.2.4 EMS Benefits for Universities

A university that invests in an EMS can realize an array of benefits to justify EMS construction costs (U.S.EPA, 2001a).

- Improve and achieve consistent compliance.
- Avoid fines and expensive corrective actions due to compliance violations.
- Lower day-to-day impacts on the environment.

- Complements and informs academic curriculum with up-to-date industry tools.
- Reduce environmental management and operating costs.
- Improve working and living conditions for students, faculty, and employees.
- Improve relations with government agencies.
- Enhance image and reputation.
- Maintain positive community relations.
- Quantify environmental performance and document trends.

2.2.5 Barriers for EMS Implementation

Some considerations may form an obstacle for implementing EMS (Granito, 2003). as follows:

- Lack of adequate time to get started on the EMS.
- An inclination to expend resources on turn-key products vs. staff "owning" essential parts of the system and using contractors to help deliver a system tailored to agency needs.
- A lack of existing training plans, mechanisms, and budget necessary for EMS implementation.
- Lack of clear EMS policies, goals, objectives, and targets.
- Failure to communicate.
- A lack of top management involvement and visibility.
- A lack of understanding from public organizations - other stakeholders.
- Political uncertainty – not knowing what the future agency priorities will be.
- Perception that EMS already exists.
- Misunderstanding of relationship to mission.

It should be noted that an EMS requires a significant investment of financial and human resources for the establishment, implementation, and maintenance of an effective EMS and to meet applicable local regulations and requirements.

2.3 Levels of EMS Implementation

While one of the most common levels of EMS implementation is through third party certification, other levels of EMS implementation exist (Rendell, 2004).

Level One - Third Party Certification to ISO 14001

In order to demonstrate conformance to the ISO 14001 standard, many organizations choose to implement and then certify their EMS using a third-party auditor (or "registrar"). The auditor performs an independent validation that the EMS conforms to the ISO 14001 standard, and that it is *"in place, complete and sufficient."* A number of auditing firms provide this service, all of which must be certified as qualified auditors.

Level Two – Complete EMS Implementation without Certification

The second level is full EMS implementation without choosing to certify the EMS through a third party audit. In this case, the organization typically chooses to self-declare that its EMS is in conformance to the ISO standard. Self-declaration allows demonstrating and communicating its environmental commitment to regulators and the public without incurring the additional costs of certification. However, a third party might be used to strengthen the self-declaration by providing some level of independent verification and/or advice.

Level Three - Partial EMS Implementation Strategies

While a complete EMS is recognized as the most effective manner to integrate environmental concerns into daily work activities, an organization does not always possess the resources to implement a complete EMS. Furthermore, a complete EMS does not always make sense for every organization. In these cases, partial implementation of an EMS through some of the elements – such as training programs and/or assessment of legal and other requirements – can be a desirable alternative for organizations.

2.4 Deming Cycle

The ISO14001 standard has been structured (Figure 2.1) according to a sequence that has come to be known as the Deming cycle (U.S.EPA, 2004).

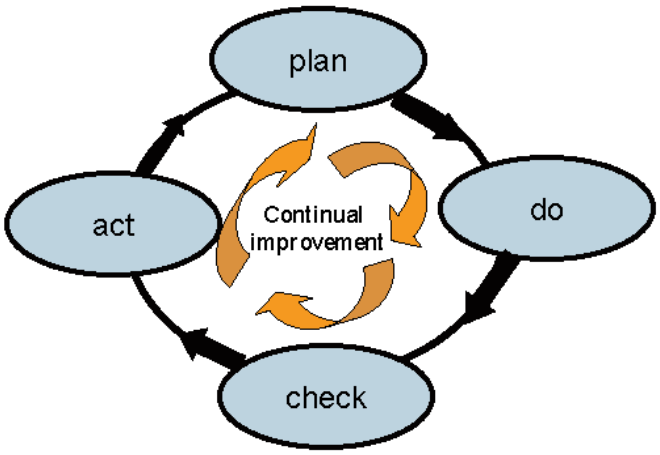

Figure 2.1 Deming Cycle

This P-D-C-A model will lead to continual improvement based upon:

Planning: identifying the environmental impacts of an organization's operations and services, tracking and following legal requirements, setting environmental goals, and establishing programs (i.e., action plans) to achieve expected goals.

Implementing or "Do": defining and communicating EMS roles and responsibilities, developing operating procedures and written programs to manage significant environmental aspects, training contractors and staff, developing methods to manage documents and records, and establishing emergency response procedures to prevent and respond to.

Checking and Corrective Action: monitoring and measuring key environmental parameters and an EMS objective to assess environmental performance, conducting internal reviews of EMS, and ensuring that specified practices are followed.

Management Review and Act: review by top management to ensure that EMS is working as intended and is effective in meeting environmental goals, Making critical course corrections, resource allocation, and strategic planning to ensure that the organization remains on the path to continual improvement.

2.5 Environmental Management System Requirements

This section describes seventeen EMS elements that are common to most EMS models (Figure 2.2) by using the ISO 14001 Standard as a starting point for describing EMS elements. This has been done for several reasons (U.S.EPA, 1999).

• ISO 14001 is a widely accepted international standard for EMS that focuses on continual improvement.

• Companies may be asked to demonstrate conformance with ISO 14001 as a condition of doing business in some markets.

• The Standard is consistent with the key elements found in many EMS models, including the European Union's Eco-Management and Audit Scheme, EPA's Performance Track and the Code of Environmental Management Principles for Federal Agencies, among others.

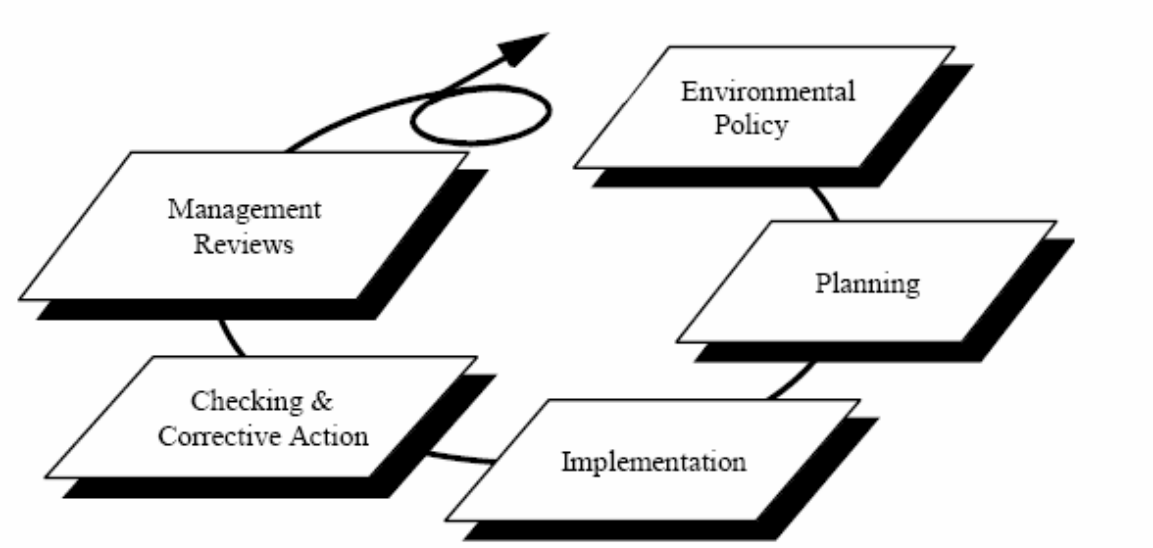

Figure 2.2 The ISO 14001 EMS Model

2.5.1 Environmental Policy Statement

An environmental policy is organization's declaration of commitment to the environment, including worker health and safety .This policy serves as the foundation for EMS and provides a unifying vision of environmental principles that will guide the actions of

employees and management. Environmental policy is a statement of the shared values throughout the organization in promoting cleaner, safer workplace practices, products, and technologies. This policy statement serves as the framework for setting environmental objectives and targets, and will be brought to life in plans and business activities. Because this statement contains the organization's vision, it may include goals that cannot be achieved immediately. This is to be expected, since continuing improvement should be one of the principles included in the policy statement (ISO 14001, 2004).

2.5.1.1 Environmental Policy at Universities

The intent of an environmental policy is to define the university's commitment to the environment through continual improvement in environmental performance. A strong, clear environmental policy can serve as both a starting point for developing the EMS and a reference point for maintaining continual improvement. The policy should be evaluated regularly and modified, as necessary, to reflect changing environmental priorities (U.S.EPA, 1999).

The policy should function in two ways: (1) within the university (faculty, students, and administrative, operations, maintenance, physical plant, and faculty employees), the policy should focus attention on environmental issues associated with activities and services; and (2) outside the university (regulators and community) the policy is a public commitment to addressing environmental issues and continually improving environmental performance (U.S.EPA, 2004).

The environmental policy should, at minimum, address the following three topics:

1. Commitment to compliance with applicable environmental legislation and regulations
2. Pollution prevention
3. Continual improvement

2.5.1.2 Developing the Environmental Policy

When developing the environmental policy the following needs to be addressed (UNC, 2001).

- The policy must be communicated to and easily understood by everyone in the organization.
- Is documented.
- Is signed by Senior Management.
- Is made available to the public.
- Is a controlled document.
- Is consistent, relevant, and appropriate with the organizational goals.
- Provides a framework for environmental objectives and targets.

2.5.1.3 The Content of the Policy

An Environmental Policy should clearly delineate the environmental areas to be addressed by the organization and should be relevant to its activities, products, and/or services. The policy may address very broad aspects of the organization's activities (such as investments) as well as more specific aspects (such as waste reduction), depending on the nature of those activities. Many environmental policies also include aspects of occupational health and safety including statements regarding the working environment (Stans, 2005).

2.5.1.4 Implementing the Policy

There is sometimes a danger that the publication of the Environmental Policy statement is seen as an end in itself, rather than the starting point for the development of the EMS. Once the policy is in place it can be used, together with the results of the Initial Environment Review, to develop detailed objectives and targets. This translation of the policy into action will take the form of an Environmental Programme or Action Plan, which will define priorities, identify employee responsibilities, allocate resources and set out measurable targets and goals (Stans, 2005). However, the Environmental Policy can only be implemented if:

- Responsibilities are allocated and the necessary organizational measures are in place to manage the subsequent phases.

- Managers accept their environmental responsibilities and in turn ensure that all employees understand their own obligations.

- Managers ensure that all staff has the knowledge and training to meet the environmental requirements of their position and duties.

2.5.1.5 Publicizing the Environmental Policy

It is important to ensure that the Environmental Policy becomes widely known and understood throughout the organization, and a version for external circulation should be prepared as well. The publishing and distribution of the policy statement can provide an ideal opportunity for management to outline the underlying reasons for developing an environmental strategy and to explain to the staff how it will be implemented within the organization. This will help to encourage, at all levels, full commitment to achieving the environmental goals (Stans, 2005).

Internal presentation of the policy should precede the formal external publication. This will give staff the chance to familiarize themselves with the policy and to have questions answered.

The publication of the policy will inevitably lead to questions from the staff such as "how will this affect me and my work". The opportunity to begin an on-going dialogue with staff concerning environmental aspects should not be missed. Input and suggestions from staff towards meeting the policy objectives can provide the basis for motivating staff and encouraging their cooperation during the implementation stage of the environmental management system.

Externally, there are many ways to publicize the policy, largely depending on the size and resources of the organization. A brochure to give to interested parties, including the environmental authorities, members of the local community etc., should be the minimum.

Many organizations also print their Environmental Policy statement in their annual (environmental) report.

2.5.1.6 Revising and Improving the Policy

In most organizations, the Environmental Policy statement is a relatively long-lived document, remaining unchanged for two or three years or longer. However, it is necessary to ensure the continuing suitability of the policy on a regular basis (Stans, 2005).

Changes might be necessary as a result of, for example:

- Changing market situation.
- Changes in processes, products, etc.
- A merger with or acquisition of another enterprise.
- The need to conform to an EMS standard (for certification).
- The views of the public or stakeholders.

It is important to include evaluation of the policy in the overall management review of the EMS and to revise and adjust it as necessary, also in view of the commitment to continual improvement.

2.5.1.7 Examples of Environmental Policies

Tufts University Environmental Policy- United States

We, the Tufts University community, affirm our belief that university faculty, staff, and students have a responsibility to take a leadership role in conducting activities as responsible stewards of the physical environment and using educational activities to promote environmental awareness, local action, and global thinking.

Emory University Environmental Mission Statement- United States

We, the Emory University community, affirm our commitment to protect and enhance the environment through our teaching, research, service, and administrative operations. We seek to foster a community that sustains ecological systems and educates for environmental

awareness, local action, and global thinking. We seek to make environmentally sound practices a core value of the University.

University of Toronto- Canada

The University of Toronto is committed to being a positive and creative force in the protection and enhancement of the local and global environment, through its teaching, research, and administrative operations. Recognizing that some of its activities, because of their scale and scope, have significant effects on the environment, the University as an institution, and all members of the University community, have a responsibility to society to act in ways consistent with the university principles and objectives.

2.5.2 Planning

2.5.2.1 Environmental Aspects and Impacts

Environmental impacts are defined as:

Any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organization's activities, products, or services (ISO 14001, 2004).

An EMS cannot directly influence the environmental impacts. It is focused on the causes of the environmental impact.

An environmental aspect is defined as:

Element of an organization's activities, products , or services that can interact with the environment (ISO 14001, 2004).

Therefore, the aspect is the cause and the impact is the effect

2.5.2.1.1 Significant Environmental Aspects

Organizations can identify hundreds or thousands of environmental aspects, depending on the level of detail in the analysis of its activities. ISO 14001 does not require an organization to consider all their aspects, but only those which are considered significant.

A significant environmental aspect is defined as:

An environmental aspect that has or can have a significant environmental impact.

An important question to be asked is what a significant environmental impact is. It states that significance can be associated with environmental concerns such as the scale, the severity, the duration and the probability of the impact, as well as by business concerns. Business concerns can include the potential regulatory and legal exposure, concerns of interested parties, effects on public image, difficulty of and the cost of changing the impact and the effects of change on other activities and processes (Stans, 2005).

One of the consequences of these criteria is that as soon as legislative or regulatory requirements, permits and similar requirements refer to a specific environmental impact, the associated environmental aspects should be considered significant.

2.5.2.1.2 Organization Interfacing with the Environment

To plan for and control its environmental impacts, an organization must know what these impacts are. But knowing what the impacts are is only part of the challenge and where these impacts come from. Stated another way, how does the organization (i.e., products, services and activities) interact with the environment (U.S.EPA, 2001b).

The identification and management of environmental aspects can (1) have positive impacts on the bottom line and (2) provide significant environmental improvements.
So, an EMS should include a procedure to identify and assess environmental aspects that the organization:

- can control, and
- Over which it can have an influence.

The organization is not expected to manage issues outside its sphere of influence or control. For example, while the organization probably has control over how much electricity it buys from a supplier, it likely does not control or influence the way in which that electricity is generated. Thus, your focus should be on the environmental aspects of your products or services. The relationship between aspects and impacts is often one of cause and effect. The term “aspects” is neutral, environmental aspects can be either positive (such as making a product out of recycled materials) or negative (such as discharging toxic materials to a stream). Aspects may result from past activities, such as spills. Once the organization has

identified the environmental aspects of products, activities, and services, it should determine which aspects could have significant impacts on the environment. Aspects that have one or more significant impact should be considered significant environmental aspects. These significant aspects should be considered when establishing environmental objectives define operational controls and consider other actions (U.S.EPA, 2001b).

2.5.2.2 Legal and Other Requirements

In order to comply with laws and regulations that apply to the organization, it must first be known what the rules are and how they affect. Compliance with legal requirements is one of the "three pillars" upon which environmental policy should be based. The potential costs of non-compliance (possible damage to the environment, revenue loss and impact on public image, for example) can be very high (U.S.EPA, 2001b).

Thus, an effective EMS should include processes to:

- identify and have access to the applicable legal requirements and other requirements to which the organization subscribes related to its environmental aspects
- determine how these requirements apply to its environmental aspects (ISO 14001, 2004).

To be in compliance with the laws and regulations that apply to University and its operations, it must (1) know what the regulations are and (2) implement procedures and install equipment to comply with those regulations. Changes in compliance requirements might require modifying environmental objectives or other elements of EMS. By anticipating new requirements, it may be able to minimize future compliance obligations through process changes. Therefore, it's important to (1) identify and use information and assistance sources such as guidance documents and technical contacts at pertinent regulating agencies, (2) maintain contact with local and national associations and workgroups, and (3) commit to reviewing legal requirements at regular time intervals during the year (U.S.EPA, 2001a).

Table 2.1 Commonly applicable environmental laws in Palestine

(Source: Ministry of Environmental Affairs MEnA)

Hazardous Materials [Law7:1999,part2-chapter2-13]	It is prohibited to store, distribute, use, treat, dump any hazardous materials or wastes whether liquid, solid or in gas phase without coordination with specializers.
Clean Air Act (CAA) [Law7:1999,part2- chapter2-21,22]	Smoking is prohibited in closed vehicles and public areas. It is prohibited to use any machine, motors or vehicles that produce exhaust air form combustion.
Environmental noise [Law7:1999part2- chapter2-26]	All organizations and individuals should commit when using any equipments, machines, loudspeakers not to exceed legal permissions.
Clean Water Act [Law7:1999part2- chapter3-28]	Water quality is defined according to the ministry.

2.5.2.3 Environmental Objectives and Targets

An objective is a facility goal that is consistent with the university's environmental policy, priority environmental aspects and impacts, and applicable environmental regulations. A target is a more detailed performance goal related to and supporting a specific objective. In other words, specific targets must be met for an objective to be achieved (U.S.EPA, 2001a).

In setting objectives, the following ideas will be considered:

- environmental aspects.
- legal and other requirements.
- current available technology.
- financial constraints and budget requirements.
- views of interested parties.
- current operations.
- feedback from the participants.

Defining EMS objectives and targets on a regular basis is a central feature of an EMS that "works." In a sense, the entire EMS is an "engine" for achieving environmental goals (i.e., objectives and targets) that will lead to continual improvements in environmental performance.

2.5.2.4 Environmental Management Program

Environmental management program should be linked directly to university's objectives and targets — that is, the program should describe how the university will translate its goals and policy commitments into concrete actions so that environmental objectives and targets are achieved (U.S.EPA, 2001b).

To ensure its effectiveness, environmental management program should define:

- The responsibilities for achieving goals (who will do it?)
- The means for achieving goals (how will they do it?)
- The time frame for achieving those goals (when?)

The program should be a dynamic one (U.S.EPA, 2001b). For example, consider modifying a program when:

- Objectives and targets are modified or added;
- Relevant legal requirements are introduced or changed.
- Substantial progress in achieving your objectives and targets has been made.
- Services, processes, or facilities change or other issues arise.

This program should not be developed in a vacuum — it should be coordinated or integrated with other organizational plans, strategies, and budgets. For example, if there is a planning for a major expansion in one of the service operations, then it makes sense to look at the possible environmental issues associated with this operational expansion at the same time (U.S.EPA, 2001b).

The EMS Manager will be responsible for implementing, reviewing, and making necessary changes in the Environmental Management Program based upon changing environmental

conditions and objectives. The EMS Manager will present any revisions to the program to all participants. He will also establish new responsibilities to the EMS member staff on the basis of revisions and new targets (U.S.EPA, 2001b).

2.5.3 Implementation and Operation

2.5.3.1 Resources, Roles, Responsibility and Authority

EMS shall provide resources essential to the implementation and control of the EMS. These resources can include human resources and specialized skills, infrastructure, technology, and financial resources (ISO 14001, 2004).

For an EMS to be effective, roles, responsibilities and authority must be clearly defined documented and communicated. The commitment of all employees is needed for an EMS to live up to its full potential (U.S.EPA, 2001a).

Top management plays a key role by providing resources needed to implement the EMS. This is one of the most important jobs of top management In some organizations, "top management" might be a single individual, while in others it might be a group of people.

An effective management system needs an advocate. Thus, top management of university should appoint a management representative. This representative (1) ensures that the EMS is established, implemented and maintained; (2) reports on its performance over time; and (3) works with others to modify the EMS as needed. The management representative can be the same person who serves as the project champion, but this is not mandatory (U.S.EPA, 2001a).

2.5.3.2 Competence, Training, and Awareness

Competence: Personnel performing tasks that can cause significant environmental impacts shall be competent on the basis of appropriate education, training and/or experience (ISO 14001,2004).

Training is an important aspect of any EMS because it can be used to build awareness and competence on (1) the EMS and (2) specific tasks related to meeting EMS objectives and targets. Training at university is often further complicated by the complex and diffuse nature

of its structure, and the number of different departments in which EMS participants work. Reasons for training employees (U.S.EPA, 2004).

• Every employee can have potential impacts on the environment.

• Any employee can have good ideas about how to improve environmental management efforts

The goal of a university's EMS training should be in three-fold:

- EMS Awareness – provide understanding of what the university's EMS is and how it works.
- Task-Specific Training – to provide task-specific training on topics to those EMS participants able to aid progress toward the EMS objectives and targets.
- Training Required by Regulations – to comply with applicable environmental and health and safety training requirements.

In tackling EMS Awareness training, university should develop an agenda and materials for EMS information that every EMS Participant should understand and then add training modules to accommodate the specific needs of particular audiences. For example, the EMS Team likely wants that each EMS Participant to understand the university's (U.S.EPA, 2004).

- Environmental policy.
- Significant environmental aspects and impacts.
- EMS roles and responsibilities.
- Initiatives for meeting EMS objectives and targets.
- Potential consequences.

In addition, the EMS Team may want to develop specific EMS awareness training modules such as:

- EMS Costs and Benefits for university's administration.
- EMS Administration Review for the EMS Administration Review Team.

- Environmental Policy for new student orientation.

2.5.3.3 Communication

Effective environmental management requires effective communications, both internally and externally (U.S.EPA, 2001a).

Effective communications to:

- motivate workforce.
- gain acceptance for plans and efforts.
- explain environmental policy and EMS and how they relate to the overall university's vision.
- ensure understanding of roles and expectations.
- demonstrate management commitment.
- monitor and evaluate performance.
- identify potential system improvements.

Two particularly unique audiences at university for internal communication are faculty and students. Faculty should be part of the EMS effort and be solicited for input and advise where appropriate; specifically faculty is critical where their activities are sources of environmental aspects; for example, chemical waste from laboratories. Faculty that works with chemical products containing hazardous constituents can be invaluable advisors regarding the environmental aspects and impact of the products used and the handling, storage, and disposal regulations that apply to waste material. Students, likewise, may have unique roles in the EMS. Some universities rely on students to gather information about operations and processes linked to EMS objectives and targets. Furthermore, all students should be aware of their ability to affect environmental aspects related to waste generation (especially solid waste and recycling) and resource use (especially energy and water use). External communication is also an important element of the EMS. Communication with interested parties such as regulators, insurers, grant organizations, local community members, alumni, and emergency responders interested in the environmental impacts of the university should be addressed and documented. By maintaining meaningful dialogue and a proactive approach with external parties, university can fulfill its environmental policy and realize EMS objectives (U.S.EPA, 2001a).

Existing methods for communicating, both internally and externally might include:

Internal Methods	External Methods
• newsletters	open houses
• intranet	focus or advisory groups
• staff meetings	web site or e-mail list
• employee meetings	press releases
• bulletin boards	annual reports
• brown bag lunches	advertising
• training	informal discussions

2.5.3.4 Documentation

To ensure that the EMS is well understood and operating as designed, university must provide adequate information to the people doing the work. There also may be external parties that want to understand how EMS is designed and implemented, such as customers, regulators, lending institutions, registrars and the public. For these reasons, the various processes that make up your EMS should be documented (U.S.EPA, 2004).

An EMS manual is a series of explanations of the processes university implements to conform to the EMS criteria. This manual should:

- describe the system's core elements (and how the elements relate to each other).
- provide direction to related documentation.

In addition to the EMS manual, university should maintain other documentation of its EMS (U.S.EPA, 2004).

First, document the processes used to meet the EMS criteria. (For example, "How do we identify environmental aspects?" "How do we implement corrective actions?") This documentation generally takes the form of system procedures. In addition, it might maintain area-or activity-specific documentation (such as work instructions) that instructs employees on how to carry out certain operations or activities.

EMS documentation is related to (but not the same as) EMS records. EMS documentation describes what university's system consists of.

2.5.3.5 Control of Documents

The primary focus of university's EMS document control should be to implement an effective EMS, not a large document control system. Even in the most streamlined systems, there are several documents that are integral to the EMS, including the environmental policy and various written procedures, records, and forms used to implement the EMS (U.S.EPA, 2001b). Document control ensures that EMS documents can be:

- Easily located.
- Periodically reviewed; updated as needed.
- Available when needed.
- Removed when obsolete.

2.5.3.6 Operational Control

To satisfy the commitments in environmental policy, certain operations and activities must be controlled. Where operations or activities are complex and/or the potential environmental impacts are significant, controls should include documented procedures. Procedures can help to manage its significant environmental aspects, ensure regulatory compliance and achieve environmental objectives. Procedures can also play a prominent role in employee training (U.S.EPA, 2001b).

Documented procedures should be established where the absence of procedures could lead to deviations from the environmental policy (including the commitments to compliance and pollution prevention) or from objectives and targets. Determining which operations should be covered by documented procedures and how those operations should be controlled is a critical step in designing an effective EMS (U.S.EPA, 2004).

Factors that could affect the need for documented procedures

- risk of activity
- complexity of activity / methods
- degree of supervision

- skills / training of workforce

Implementation of operational control is accomplished through the establishment and maintenance of operational procedures and controls to ensure that EMS Environmental Policy, objectives and targets can be met. EMS will consider the different activities that contribute to significant environmental impacts when developing or modifying operational controls and procedures (U.S.EPA, 2004).

2.5.3.7 Emergency Preparedness and Response

Nearly all universities have experienced an event that required some kind of emergency response and most have suffered numerous events both large and small. Unfortunate events such as an employee injury, a spill of hazardous chemicals, or a fire do occasionally occur. With university typically using a wide variety and quantity of hazardous chemicals, and having a wide range of faculty, students, and staff using those chemicals, the potential for accidents is high. As a result, university must be particularly vigilant in planning and preparing for emergencies. Emergency planning can limit injuries; protect faculty, students, staff, neighbors and the environment; reduce asset losses; and minimize damage to the university image (U.S.EPA, 2001a).

An effective emergency response and preparedness program should include provisions for:

- Assessing the potential for accidents and emergencies
- Preventing incidents and their associated environmental impacts
- Responding to incidents
- Mitigating impacts associated with these incidents

Often, the most difficult part of developing emergency preparedness and response plans is identifying the potential for accidents and emergencies. The EMS Manager should form a team composed of university personnel (and outside consultants or regulators if necessary or beneficial) to examine all facility activities (U.S.EPA, 2004).

Helpful Documents for Gauging Emergency Risk and Making Preparations

- Site maps to determine relative locations of hazardous chemicals/wastes/operations to people and environmentally sensitive areas

- Drainage plans, including surface and subsurface conveyances
- Past records and reports of emergencies and any rectifying actions taken

Useful information sources:

- Material safety data sheets
- Plant layout
- Process flow diagrams
- Engineering drawings
- Design codes and standards
- Specifications on safety systems (alarms, sprinklers, etc.)

2.5.4 Checking and Corrective Action

2.5.4.1 Monitoring and Measurement

Basing decisions and operational improvements on quantified environmental performance data is an important part of the EMS philosophy should be a central feature of EMS. If the primary goal of an EMS is to improve environmental performance through consistent compliance and waste reduction, there must be measurable parameters, or metrics, that reflect environmental performance trends. After objectives and targets are created, specific parameters must be identified and measured to track progress toward the objective and target (ISO14001, 2004).

Monitoring and measurement enables university to:

- evaluate environmental performance.
- analyze root causes of problems.
- assess compliance with legal requirements.
- identify areas requiring corrective action.
- improve performance and increase efficiency.

University should develop procedures to (U.S.EPA, 2001a):

- monitor key characteristics of operations and activities that can have significant environmental impacts and/or compliance consequences;

- track performance (including the progress in achieving objectives and targets);
- calibrate and maintain monitoring equipment; and,
- through internal audits, periodically evaluate compliance with applicable laws and regulations

Target-Specific Metrics

Target-specific metrics are unique university's objectives and targets. Metrics that relate to common objectives and targets are listed but not limited to:

- Energy use from on-campus dormitory lighting
- Water use in recreational and athletic facilities
- Monthly volume of sulfuric acid used by chemistry department laboratories
- Monthly use of floor strippers containing toxic chemicals by janitorial operations
- PC energy consumption from campus computer laboratories
- Monthly volume of pesticides used on campus for vector control in buildings
- Tons of waste landfilled per year

Since all universities use water and energy, conservation of those two resources is a common target. Because they are consumed in so many ways, target-specific metrics should be defined in a way that can be easily measured and monitored. Laboratory-generated wastes are another common target, and should be more easily measured because of regulatory compliance records (U.S.EPA, 2004).

Effective measurement programs are to be: simple, flexible, consistent, ongoing, produce reliable data, communicate results

2.5.4.2 Nonconformance, Corrective and Preventive Action

No EMS is perfect. University may identify problems with EMS system (especially in the early phases) through audits, measurement, or other activities. In addition, EMS will need to be changed as university's changes and grows (U.S.EPA, 2001b). To deal with system deficiencies, University needs a process to ensure that:

- Problems (including nonconformities) are identified and investigated;
- Root causes are identified;

- Corrective and preventive actions are identified and implemented;
- Actions are tracked and their effectiveness is verified.

EMS nonconformities and other system deficiencies (such as legal noncompliance) should be analyzed to detect patterns or trends. Identifying trends allows anticipating and preventing future problems (U.S.EPA, 2001b).

Focus on correcting and preventing problems. Preventing problems is generally cheaper than fixing them after they occur (or after they reoccur).

EMS nonconformance is:

- EMS procedures are not executed correctly or are not periodically reviewed by the person responsible for the procedure.
- EMS Participants are unaware of their EMS-related responsibilities.
- Facility-wide and target-specific data are not evaluated and corrected.

Why do EMS problems occur?

- poor communication
- faulty or missing procedures
- equipment malfunction (or lack of maintenance)
- lack or training
- lack of understanding (of requirements)
- failure to enforce rules
- corrective actions fail to address root causes of problems

Corrective actions should (1) resolve the immediate problem (2) consider whether the same or similar problems exist elsewhere in the organization, and (3) prevent the problem from recurring. The corrective action process also should define the responsibilities and schedules associated with these three steps.

Any corrective or preventive action taken to eliminate the causes of actual and potential nonconformance shall be appropriate to the magnitude of the problems and commensurate with the environmental impact encountered (ISO14001, 2004).

2.5.4.3 Control of records

Records provide evidence that the processes that make up your EMS are being implemented as described.

Records management should enable you to prove that the university is actually implementing the EMS as designed. Records management is often viewed as bureaucratic, but it is hard to imagine a process or system operating consistently without keeping accurate records. Good records will primarily benefit the university team while they develop, implement, review, and revise the EMS. Occasionally it may be necessary to prove the effectiveness of the EMS to people outside the university including community organizations, environmental groups, or a "registrar" that has been asked to certify the EMS as conformant to an environmental standard such as ISO 14000/14001.

The basics of records management are straightforward: EMS team need to decide what records they will keep, how they will keep them and for how long. They should also think about how they will dispose of records once they no longer need them (U.S.EPA, 2001b).

Tips for Implementing a Manageable and Complete Records System:

- Focus on records that add value – avoid bureaucracy. If records have no value, do not keep them. Make the records that you do keep accurate and complete.
- Consider combining your records management systems for environmental and health and safety.
- Use a computer to maintain records and documents; make records available to employees via a designated computer or via a university network.
- Consider the need for security. Should access to some records be limited? Should duplicates of some records be maintained elsewhere?
- Establish a records retention policy considering relevant regulatory requirements and stick with it.

Types of Records :

- Legal, regulatory and other code requirements.
- Results of environmental aspects identification.
- Reports of progress towards meeting objectives and targets.
- Permits, licenses and other approvals.
- Job descriptions and performance evaluations.
- Training records.
- EMS audit and regulatory compliance audit reports.
- Reports of identified nonconformities, corrective action plans and corrective action tracking data.
- Hazardous material spill / other incident reports.
- Communications with customers, suppliers, contractors and other external parties.
- Results of management reviews.
- Sampling and monitoring data.
- Maintenance records.
- Equipment calibration records.

2.5.4.4 Internal Audit

EMS Audit "A systematic and documented verification process of objectively obtaining and evaluating evidence to determine whether an organization's environmental management system conforms to the environmental management system audit criteria set by the organization, and for communication of the results of this process to management. (ISO14001,2004).

After the EMS has been established, verifying the implementation of the system will be critical. To identify and resolve EMS deficiencies the EMS Team must actively seek them out.

In smaller universities, EMS audits are particularly relevant since managers are often so close to the work that they may not see problems or bad habits that have developed; in larger universities, managers may develop too much distance to operations and conditions

within the university making EMS audits similarly important. Periodic EMS audits will establish whether or not all requirements of the EMS are being carried out in the appropriate manner (U.S.EPA, 2001a).

Audit procedure should describe:

• Audit scope (areas and activities covered).
• Audit frequency.
• Audit methods.
• Key responsibilities.
• Reporting mechanisms.

And when implemented, should result in:

• Continuous improvement.
• Consistent EMS performance.
• Avoiding or minimizing surprises anticipating problems.

Options for University EMS's Auditors

- Consultants: Hire EMS experts to develop and perform audits or train University staff on auditing techniques.
- Faculty and Students: University has access to professors, graduate, and undergraduate students who can serve as an excellent audit team. Whether trained and directed by outside consultants or professors, make sure your expectations of the audit team are met and consider paying your auditors.
- Exchange services as an auditor with another Universities; colleagues from University will likely best understand University's organization and operational challenges and can serve as a good comparative case study.

2.5.5 Management Review

EMS must be reviewed periodically by top management to stay "healthy". Management reviews are one key to continual improvement and for ensuring that the EMS will continue to meet university's needs over time (ISO 14001, 2004).

Management reviews also offer a great opportunity to keep EMS efficient and cost-effective. At regular intervals management should carry out a review of the environmental management system to ensure its continuing suitability and effectiveness. (Fisher and Pai, 2000). One approach to conducting an EMS review is through the use of a checklist. EMS Review checklists may be developed to assist and standardize the review at an installation, but are not a substitute for critical and independent judgment or decision making. Checklists should only be used as a reference point to affirm that key criteria and evaluation areas have been examined (Cece, 1999).

Chapter Three
Research Methodology

In order to achieve the objectives of this study, four main methodological approaches were applied. First, a comprehensive literature review about environmental issues including environmental policies at universities, environmental management system. Second, a collection of data for environmental activities at university in order to recognize what is the environmental aspects of BZU. Third, a questionnaire is distributed among BZU society of employees and students. Fourth, analysis was done by using the SPSS software.

3.1 A Comprehensive Literature Review

Environment is becoming an essential prospect in any activity within universities. Many universities around the world adopt environmental policies to emphasize the commitment of control their environmental activities. Other universities in addition to their commitment policy had implemented EMS and others got the ISO 14001 certificate.

There was a comprehensive literature review about the following subjects:

- The declarations of environmental commitments.
- Definition Environmental Management System.
- Levels of EMS implementation.
- The Deming Cycle.
- EMS requirements.

3.2 Data Collection

There was a collection of available data from different departments of BZU such as:

- The Engineering office
- General service department
- Human resource department
- Finance department
- Registration department

Data collected of the several departments of BZU was; consumption of energy and water, consumption of paper, size of solid wastes, Heating capacity, vehicles' parking ,number of students and employees at BZU. This methodological approach helped in order to answer

the first question of the thesis questions in presenting and categorizing the environmental activities at BZU.

3.3 A questionnaire developed and distributed

In order to answer the three remaining questions of the thesis a questionnaire was developed and distributed with a help from a five students team .Distribution of questions for each main question was as follows:

Does BZU Community Relate to its Environmental Activities?

Do you know how and where solid wastes are disposed off at BZU? (solid wastes: rubbish, plastics, glass, paper, construction & food …)
Are you aware that BZU do have a wastewater treatment plant at campus?
Do you think the treated water can be used for agricultural irrigation of campus trees?
In your opinion, does the university need more greening areas or trees?
Are you a smoker?
Are you satisfied with the condition system (Heating and cooling) at the university?
Do you think that the speakerphones used in certain activities make a noise?
Do you think that parking areas (for cars) should be outside the campus?

Does BZU Community Have the Awareness of Environmental Issues?

Do you have any information about environmental conditions at BZU?
If there is a rule to prohibit smoking under a roof at BZU, will you agree?
Have you any idea about solid waste recycling?
Do you feel a need for more environmental information illustrating actual status at BZU?
Have you heard about EMS?
Do you know what the ISO 14001 is?
Does BZU need adequate internal communications about EMS?
Do you think that there is a few information about environmental knowledge?
Do you think that there is a relationship between environment and economy?

In your opinion, is it more beneficial to have a university requirement concerning environment instead of other courses?
Do you spend more than one hour each day on the internet?
Are you aware that foreign universities do have environmental policies?

Is there an Acceptance to Develop an Environmental Policy as a First Step to Develop EMS for BZU with Emphasis on Commitment?

Will you use recyclable materials?
Would you accept the separation system of materials at source (papers, plastics, glasses, food…) in the central cafeteria and the campus?
Is there a need for an environmental office at BZU?
If compulsory course named "Environmental Science and Engineering" is offered, would you register for this course?
In your opinion, does BZU need an environmental policy?
Are you ready to attend a workshop about implementing EMS at BZU?
If there are environmental rules at BZU, are you ready to commit your self to?
Are you ready to change some habits in order to adapt with any environmental rules?
Are you with taking serious actions with any person who violates environmental rules?
If it is needed to cut a certain percentage (0.5-1%) of your salary or registration fees for EMS system at BZU, will you accept?
Do you think BZU should have one?
Are you with the saying “preserving the land is more difficult than having a land”?

3.4 Questionnaire analysis using SPSS

After receiving the survey responses from the random samples, data analysis was conducted based on the questionnaire findings. Findings were demonstrated using the SPSS program version 12 between employees and students, where these two categories form BZU community. Analysis was according to the following data:

- Population size 7820
- Marginal confidence interval 5%
- Confidence interval 95%
- Sample size 366
- Distributed questionnaire papers 400
- Received questionnaire papers 300
- Respondents of employees 50
- Respondents of students 250

Chapter Four
Results and Discussion

To discuss the four questions of the thesis, they are divided into two groups. Group one contains the first question about exploring the environmental activities at BZU, which by collection of specific data from different university's departments was analyzed. Group two contains the relation, awareness, and acceptance of BZU community to develop EMS. Finally, an EMS for BZU was suggested.

4.1 BZU Environmental Categories

In organizing the data collected for this thesis, it was noticed that the environmental functions at BZU can be divided into five categories according to the General Service Department by which these categories form the main issues at BZU.

4.1.1 Energy

Birzeit University's main energy is purchased from Jerusalem District Electricity Company (JDECO), while secondary energy is obtained from four diesel generators of capacity (1400) KVA, which work when there is a cut of main energy. During the period from 2001 to 2005, total energy consumption, increased from 430 thousand kWh (80 kWh/person) to 3 million kWh (422 kWh/person) (Figure 4.1) resulting in the release of nearly 1290 tons of CO_2 gas into the atmosphere.

Electricity is used for lighting, elevators, air conditioning (heating and cooling), ventilation fans, laboratories' equipments, Cafeteria's equipment, office equipment (computers, photocopy machines, printers, faxes) , and also in glass workshop in science building.

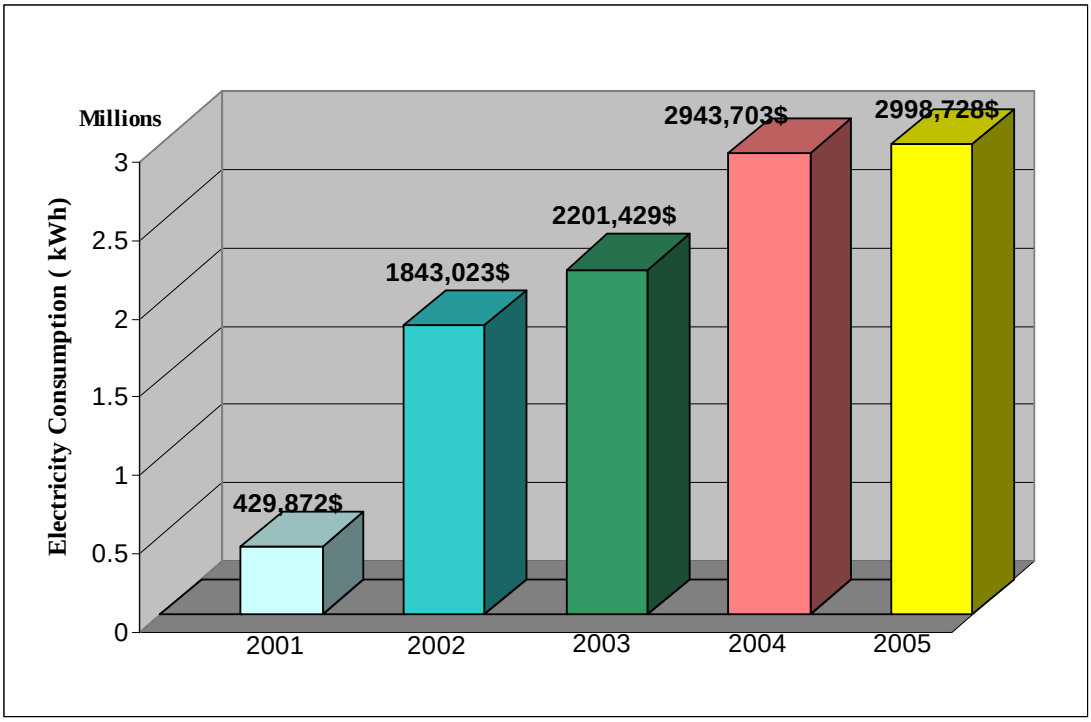

Figure 4.1 Electricity consumption at BZU (2001-2005)

4.1.1.1 BZU's HVAC System

HVAC system consumes about two thirds of the building's energy. BZU's HVAC system contains many different components including: air conditioning fan coil units, compressors and condensers, multiple exhaust fans, chilled water pumps, heat exchangers, and hot water pumps. All of these devices require the use of electricity in order to operate. To fulfill its heating requirement, translating to the combustion of roughly 190 cubic meter of diesel, the electricity used by BZU's HVAC system in 2005 is equal to 2.04 million kWh, resulting in the release of nearly 877 tons of CO_2 gas into the atmosphere (Table 4.1).

Table 4.1 Distribution of Boilers at BZU campus

Building's Name	No of Boilers	Capacity(KW)
Science Building	3	1173.1
Omar Al-Aggad Engineering Building	2	1177.56
Administration Building	2	410.2
Yusuf Ahmed Alghanim Library		
Kamal Nasir Auditorium		
Commerce and Economics Building	1	420
Engineering Workshops Building	1	110.5
Azeez Shaheen Clinic	1	134
Institute of Law Building	1	275
Al Maktoum Building	1	580
Naseeb Azeez Shaheen Building	1	111
Physical Education Building	1	410
Library Annex	1	215
Institute of Women's Studies Building	1	252
Total	16	5268.36

4.1.1.2 Consumption of Fossil Fuel on Campus

BZU uses diesel fuel for heating campus' buildings in winter and generating electricity from the two electrical generators when there is a cut in electricity. Diesel is a non-renewable fossil fuel and its extraction, transport, and combustion have negative environmental impacts by emitting harmful gases such as CO_2, CO, SO_x to the atmosphere. It is preserved in underground tanks besides each building in the university (Table 4.2).

Table 4.2 Distribution of diesel tanks in BZU campus

Building's Name	Diesel Tank	Capacity (m^3)
Science Building	1	15
Omar Al-Aggad Engineering Building	2	50
Administration Building	1	15
Commerce and Economics Building	1	15
Engineering Workshops Building	1	10
Azeez Shaheen Clinic	1	10
Institute of Law Building	1	15
Al Maktoum Building	1	15
Naseeb Azeez Shaheen Building	1	10
Physical Education Building	1	15
Library Annex	1	10
Institute of Women's Studies Building	1	10
Total	13	190

According The General Service Department the consumption of diesel for heating purposes was 146 m^3 (84,000 $) for the academic year 2004/2005.

4.1.2 Water

Palestine is suffering from a shortage of clean and drinking water due to occupational activities, and so is BZU, which faces especially at summer season many problems due to the continuous cut of water. BZU obtains its water needs from Birzeit Municipality which buys water from the water undertaking company.

Water is used at BZU for drinking, cleaning, toilet use, Cafeteria's use (cooking, cleaning), laboratories use, irrigation of gardens, construction utilities, feeding boilers (closed systems) and transfer waste into the wastewater treatment plant (Figure 4.2).

Rainwater is not used as a minor source for water. A rain water collection system was proposed to be a central system for all university, but it was canceled and substituted by an on site rain water collection system. Any new building after 2005 will have an independent

rain water well in order to supply toilets and urinals (every new building will be designed on the basis of separation the pipes of toilets and urinals from that of wash basins and lavatories).

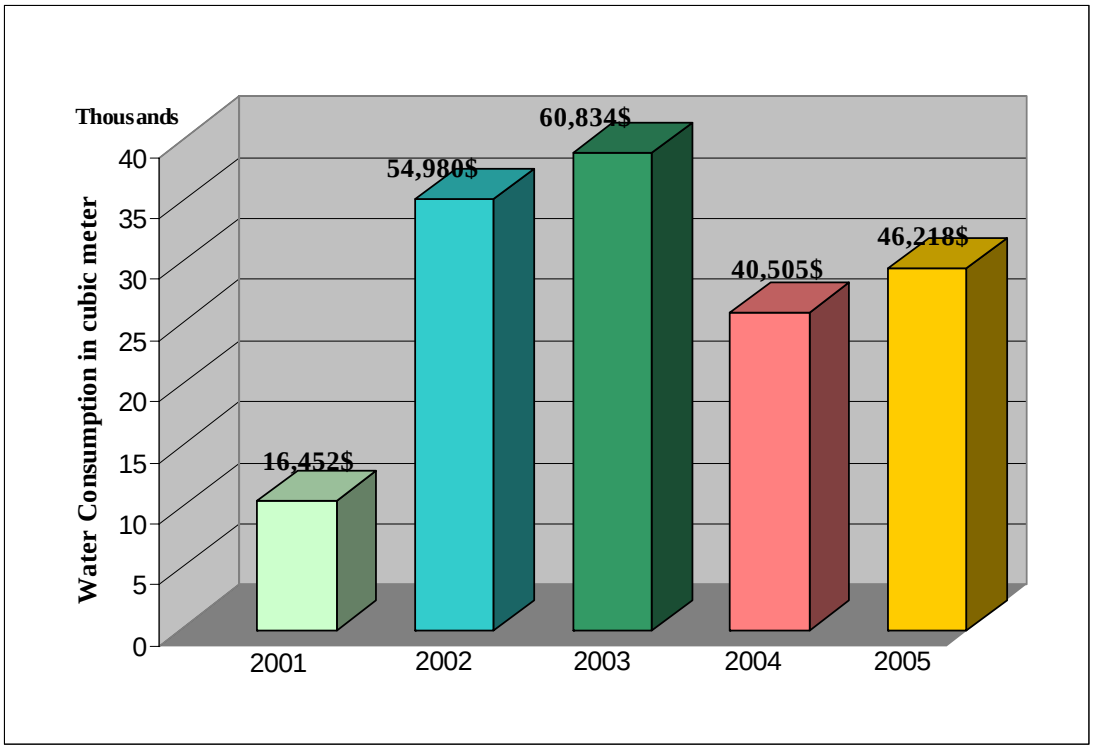

Figure 4.2 Water consumption at BZU (2001-2005)

4.1.2.1 Wastewater treatment plant

It is located beside the eastern gate of BZU; it is introduced to treat waste water from all facilities of the university with a maximum capacity of 600 m^3/day.

Domestic wastewater from all the buildings, including the main cafeteria as well as various laboratories, of BZU campus is collected with a central sewerage network. Part of the collected sewage is pumped while the rest flows by gravity into the sewage treatment plant.

Preaeration of wastewater influent is accomplished in the holding tank to freshen the sewage and control of odour problems. From the holding tank the influent is pumped to the aeration basin, where a long period of aeration is combined with a high sludge biomass, resulting in a low organic load.

After the biological unit the treated effluent is separated from the suspended solids in an integrated circular secondary tank. The treated effluent is further treated in a slow sand filter

to remove suspended solids, viruses and microbial pathogens. Excess sludge is pumped from the preaeration zone to the aerobic digestion zone. Minimal excess biosolids are removed from the sludge stabilization tank. For safety reasons, no agricultural usage is practiced. The treated effluent is used for landscape irrigation at BZU campus (Al-Sa'ed and Zimmo, 2004).

Table 4.3 Performance data for BZU-sewage treatment plant (October, 2005)

Parameter	**Influent**	**Contact Zone**	**Effluent**	**% Removal**	**Recommended Values**	**Remarks**
COD_{Total} (mg/l)	776		104	87	> 90%	fair
$COD_{Filtered}$ (mg/l)	581		82	86	> 90%	fair
NO_3^- (mg-N/l)	0.20		24		<10 mg/l	
NH_4^+ (mg/l)	61		22	64	≈ 0 mg/l	O.K
Suspended Solids(mg/l)		3710			200-3000 mg/l	fair
Settlable Solids (ml/1000 ml)		≈ 125			50-100 ml/1000 ml	fair
PO_4^{3-} (mg/l)					1-5 mg/l	

4.1.3 Solid wastes

Solid waste is a by-product of consumption. This waste has to go somewhere, and in the case of BZU, waste is collected by General Service Department in addition to a private waste collection company. It is disposed of to a number of containers spread all over campus, and then it is taken to the dump by Birzeit Municipality. The total amount of solid waste produced by BZU was 429 tons in 2005. There exist 13 containers all around the campus asshown in (Table 4.4):

Table 4.4 Waste collection containers at BZU campus

Building	**No of Containers**
Commerce building	2
Science building	3
Woman Institute building	1
Engineering building	2

Al-Maktoom building	4
Law Institute building	1
Total	13

4.1.3.1 Classification of waste at BZU

Waste produced by University operations can be classified under the following headings.

- Controlled waste.
- Chemical waste.
- Discharges to sewer.
- Special wastes
- Construction and Demolition Waste

Controlled Waste

Includes the vast majority of waste produced by the University and includes domestic waste produced by offices, classes, food handling, and other domestic activities such as the using of paper, glass, plastics, woods, and metals.

Chemical Waste

Is defined as any waste that consists wholly or partly of human or animal tissue or other bodily fluids, excretion, drugs, or other pharmaceutical products, swabs or dressings, or syringes, needles or other sharp instruments. This waste is produced from main clinic, science laboratories.

Discharges to Sewer

It was found that 4.94 kg/d of chemical wastes are disposed through sewerage system to the Wastewater Treatment Plant (Al-Sa`ed., Shalash, Dughra, and Ayyad, 2003).

General laboratories wastes can be discharged to the sewer provided that:

- No prescribed substances may be discharged.
- No inflammable effluents may be discharged.
- No materials immiscible with water may be discharged.

Special waste

Sewage sludge, residual solids, and semi-solids, resulting from the treatment of waste water plant.

Construction and demolition Waste

This waste is arising from the construction, repair, maintenance, and demolition of buildings and structures. It is mainly brick, concrete, hardcore, subsoil and topsoil, but it can also include quantities of timber, metal, plastics and (occasionally) special waste materials such as fiber glass. Usually disposal of this waste will be the responsibility of contractors rather than BZU itself.

4.1.3.2 Paper Consumption

At BZU there are many ways in which paper is used; for office work, class utilities, students' activities, announcements, memos (Table 4.5).

Table 4.5 Data about paper consumption in BZU (2001-2005)

	2001	**2002**	**2003**	**2004**	**2005**
Packages	5175	4635	6100	6584	7496
No of papers	2587500	2717500	3050000	3292000	3748000
Weight (kg)	12937.5	13392.5	15250	16460	18740
Price ($)	15371	16135.3	17010.05	17978.77	21362.98

Paper consumption was analyzed according to the data from the finance department at BZU, where these papers used for photocopying and printing purposes.

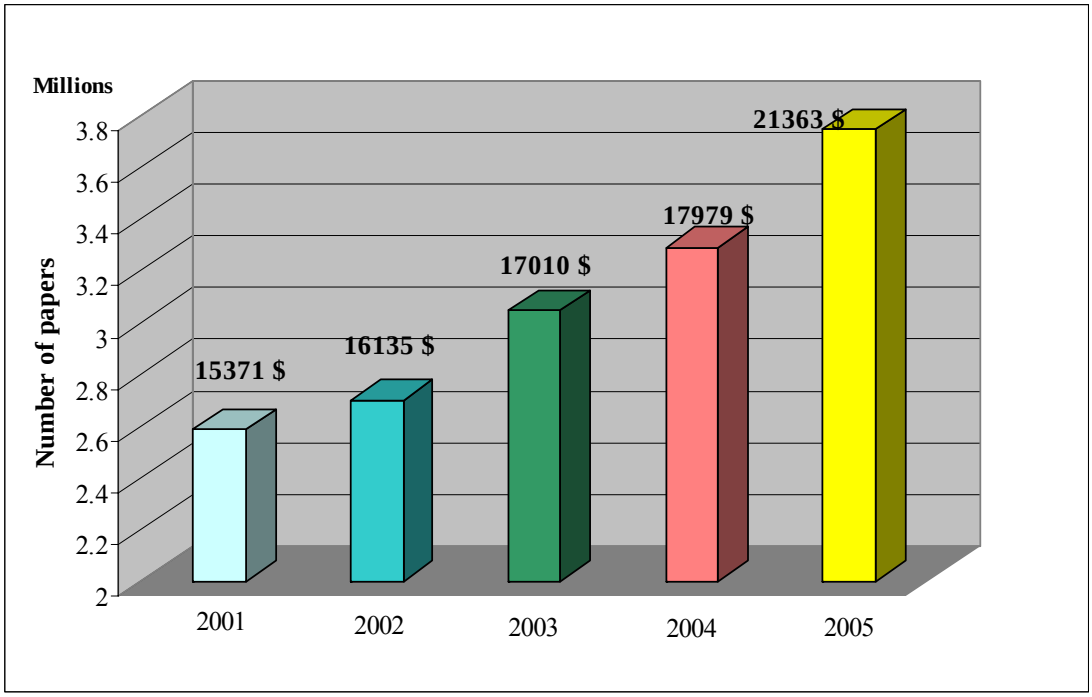

Figure 4.3 Paper consumption at BZU (2001-2005)

4.1.4 Transportation

Due to its location between Birzeit and Ramallah cities, Bzu is accessible by public transportation taxes and buses traveling to mentioned cities hourly each day with more than 100 taxis and 10 buses.

General Service Department developed a traffic system by which all taxis coming from Ramallah park at the western entrance of campus where buses are allowed to take students from inside campus to Birzeit. Regulations are not to allow any vehicle enters the campus by any load (Table 4.6).

Table 4.6 Number of available parking inside BZU campus

Location of Parking	**Parking**
Engineering Building Southern Parking	50
Engineering Building Eastern Parking	20
Maintenance Building Parking	25
Workshops Building Parking	8
Student's Council parking	10
Science Building Parking	30

Commerce Building Parking	45
Higher Studies Building Parking	47
Main Library Parking	7
Library Annex Parking	5
Law Center Parking	30
Administration Building Parking	35
Al Maktoum Building (The Cafeteria)	15
Institute of Women's Studies Building Parking	14
Physical Education Building Parking	10
Southern Main Street (Behind science,commerce,HS buildings)	67
Total	418

4.1.5 Human activities

This category is divided into how BZU community affects the environment by its activities.

4.1.5.1 Health Aspects

The most significant aspect of this issue is smoking cigarettes within closed rooms offices, labs, and cafeterias. Smoking affects human health and leads to many diseases. Recently, there are new regulations to prohibit selling cigarettes at campus but there still permission for smoking inside buildings and cafeteria.

4.1.5.1.1 Negative Impact of Smoking

Cigarettes contain more than 4000 chemical compounds and at least 400 toxic substances. When inhaling, a cigarette burns at 700°C at the tip and around 60°C in the core. This heat breaks down the tobacco to produce various toxins. As a cigarette burns, the residues are concentrated towards the butt (Dr Petrie, 2005). The products that are most damaging are:

- tar, a carcinogen (substance that causes cancer)
- nicotine is addictive and increases cholesterol levels in your body
- carbon monoxide reduces oxygen in the body
- components of the gas and particulate phases cause chronic obstructive pulmonary disorder (COPD).

The damage caused by smoking is influenced by:

- the number of cigarettes smoked

- whether the cigarette has a filter
- how the tobacco has been prepared.

4.1.5.1.2 Major diseases caused by smoking

Cancer: Ninety percent of lung cancer cases are due to smoking.

Smokers are more likely to get cancer than non-smokers. This is particularly true of lung cancer, throat cancer and mouth cancer, which hardly ever affect non-smokers.

Chronic obstructive pulmonary disease

(COPD) is a collective term for a group of conditions that block airflow and make breathing more difficult, such as:

- Emphysema - breathlessness caused by damage to the air sacs (alveoli)
- Chronic bronchitis - coughing with a lot of mucus that continues for at least three months.

Smoking is the most common cause of COPD and is responsible for 80 per cent of cases.

Cardiovascular disease

Cardiovascular disease is the main cause of death due to smoking. Hardening of the arteries is a process that develops over years, when cholesterol and other fats deposit in the arteries, leaving them narrow, blocked, or rigid. When the arteries narrow (atherosclerosis), blood clots are likely to form. Smoking accelerates the hardening and narrowing process in your arteries: it starts earlier and blood clots are two to four times. Cardiovascular disease can take many forms depending on which blood vessels are involved, and all of them are more common in people who smoke (Dr Petrie, 2005).

- Coronary thrombosis: a blood clot in the arteries supplying the heart, which can lead to a heart attack. Around 30 per cent are caused by smoking.
- Cerebral thrombosis: the vessels to the brain can become blocked, which can lead to collapse, stroke and paralysis.

Other risks caused by smoking

- Smoking raises blood pressure, which can cause hypertension (high blood pressure) - a risk factor for heart attacks and stroke.

- The blood vessels in the eye are sensitive and can be easily damaged by smoke, causing a bloodshot appearance and itchiness.
- Heavy smokers are twice as likely to get macular degeneration, resulting in the gradual loss of eyesight.
- Smoking causes an acid taste in the mouth and develops ulcers

Passive smoking

The 'side-stream' smoke that comes off a cigarette between puffs carries a higher risk than directly inhaled smoke. Passive smoking seems to increase the risk of lung cancer, but the evidence for an increased risk of heart disease is not yet conclusive.

4.1.5.2 Noise

Many people are sensitive to noise. Generally, at the normal day noise is not so high. Abnormal day means that there are activities that produce noise and that affect the community of BZU. Noise is generated due to the following reasons:

- Noise impacts related from construction on campus.
- Noise impacts produced by the increase in vehicular traffic.
- Noise impacts produced by using loud speakers at festivals and ceremonies.
- Noise impacts produced by playing games in the main playfield.
- Noise impacts from heating and cooling systems.
- Noise impacts produced from laboratories (Soil laboratory).
- Noise impacts produced from taking between classrooms.

4.2 Questionnaire Results

The questionnaire questions mentioned in the introduction chapter will be dealt with in the following discussion of the questionnaire. Results are summarized in appendix C.

4.2.1 Does BZU community relate to its environmental activities?

Many environmental activities at BZU take place within the campus; some of the community at BZU notices these activities while the others don’t. Next results reveal how much the community of BZU relates to its environmental activities and how much these activities affect it (Refer to Appendix B and C).

Disposing of solid waste is a daily activity at campus, 38% of employees and 18% of students know how solid waste is disposed of and the location of disposing containers.
Disposing the solid wastes is an obvious activity, where cleaning and rubbish collecting labors spread all over the buildings of the campus and the yards among students and employees. Also, Birzeit municipality rubbish truck comes everyday to collect wastes from the waste containers. Ignorance of employees and students by low percentages may be due to the daily use of a small waste baskets located in offices, classes and yards where the waste containers are located behind buildings where not many students and employees go there.
WWTP is located beside the east gate of BZU, 88% of the employees aware of its location while 58.4% of students do. Treated water from the WWTP is used for agricultural irrigation of campus' trees, 88% of employees and 74% of students realize this fact. WWTP is the major part of treating waste water at the sewerage system at BZU, BZU community aware of the importance of the WWTP and realize that treated water can be used for irrigation and so it is.

There should be more greening areas at the campus, so 100% of the employees agreed to have more greening places at the campus while 87.2% of students share the same vision.
BZU lacks of greening areas inside the campus where most trees exist around the university. All of the employees assure that campus need more greening areas, Students, the most affected by lacking of green areas agree with a high percentage to have as seating areas with shadow under trees in the summer season.

Smoking is a social activity rather than a healthy aspect at BZU, 36% of employees are smokers by which 72.2% of administrative employees and 27.8% of academic employees, while 18.4% of students are, where 28.8% of male students and 9.1% of female students. Smoking is a surprising result, where it seems that there are many smokers in BZU in comparison to the culture. This could be a misleading result, since some people are too shy to admit smoking, especially females. But, there are many non-smokers at the university; in addition that many students have financial commitments in their daily life more essential than smoking. So, smoking can be considered as an extra expenditure for BZU community.

Moreover, the awareness of the harmful consequences of smoking can be a major factor of the low percentage of smokers at BZU.

Condition system spread all over the university but only 28% of employees are satisfied with it, while 38.4% of students are satisfied with. This is also a surprising result. All the buildings at BZU are fully heated during the winter and some zones are cooled during the summer. Some classes or offices individually may have some problems of duct system by loosing heating air or noise generated of galvanized ducts but most of the buildings are heated by radiators which are more efficient than duct system.

Loudspeakers, which are used in festivals and ceremonies, have a negative effect by making noise in accordance to the employees who by 84% consider that loudspeakers make a noise in contrast with the students who by 61.6 % agreed with the same opinion.

Student's activities by using loudspeakers in their special ceremonies especially at the elections time make a noise which affect students who attend lectures by losing their concentration with the loud noise, also employees who need quietness to perform their work adequately.

Finally, 32% of employees agreed to put cars outside the campus where 66% of students did. That's clear, where many employees have private cars and need their cars beside the building that they work in. On the other hand, most students don't have private cars so they agreed to park outside the campus. The essential issue that cars' parking occupy much space beside and in front and at the rear of buildings instead of green areas and seating areas for students, also they make obstacles for walking. Using cars inside campus also may disturb pedestrians.

4.2.2 Does BZU community have the awareness of environmental issues?

Modernized societies take care of the awareness for their population about the environmental issues. Next discussion about the results of the questionnaire will show how much BZU community has the awareness of the environmental issues.

The awareness of environmental conditions at BZU is a general question, but the aim of this question is to test how much the community is familiar with this word and to allow a deep thinking about the environment at BZU. So, 48% of employees, 54.2% of them

administrative and 45.8% are academic. Where 30.8% of students, 34.7% are males and 27.3% are females, aware of the environmental conditions at BZU or in other words these percentages show how much employees and students are familiar with the word environment, this percentage seems low.

Awareness concerning health issue is high among the BZU community, where for a proposed rule to prohibit smoking under a roof at university 72% of employees and 76.8% of students have the desire to implement this rule.

Recycling is becoming an important factor in reducing the size of solid waste and the cost of getting rid of it.72% of employees and 40.8% of students aware of recycling and its benefits. Students have less awareness than employees.

More environmental information illustrating actual status at BZU is needed by 92% of employees and 82.8% of students. These percentages reveal that there is a lack of environmental data about BZU and these data can reflect the actual status of BZU and to which level environmental achievement has reached.

EMS is a new concept introduced to BZU community where 22% of employees and 14.4% of students have heard about EMS. That is not surprising, an EMS is not well known among universities in the Middle East or even in the Arab society except for special organizations and industries.

ISO 14001 is also new to BZU community where 16% of employees and 15.6% of students have heard about it.

A need for adequate internal communications about EMS has to be done with the opinion of 92% of employees and 84.8% of students. BZU has an internal communication with employees by webmails and by students with Ritaj; so it is easy to spread any regulations by these facilities.

Community of BZU agrees that there is a few knowledge about environmental knowledge where 90% of employees and 79.2% of students aware there is a few information about environment.

Environment and Economy have interrelated relationship as 98% of employees and 86.4% of students agreed. Indeed, environment is affected by the unfairly activities of economists and businesses stakeholders. The majority of employees and students are aware of this fact.

To have a university requirement concerning environment instead of other courses is an idea which was accepted by 80% of employees and 72% of students.

Spending more than one hour on the internet each day is matched with the employees by 72% and 54.2% of students. This result shows how much the community of BZU introduce to various subjects and if the environment among these subjects. It seems that employees are aware of environmental issues more than students who may not have the time to use the internet like the employees due to their studying and their academic interests concerning their majors.

Foreign universities have environmental policies, 72% of employees and 70.4% of students know this fact. Previous result about using internet has direct relation with this result where through internet any web searcher can find that many universities in the world have indeed an effective environmental policies .

4.2.3 Is there an acceptance to develop an environmental policy as a first step to develop EMS for BZU with emphasis on commitment?

To have an environmental attitude, there should be a practical step in order to reflect the awareness of this new requirement for a modernized universal society. That step, is by adopting an environmental policy which is the basis of a successful environmental management system. The next discussion will find out the way of commitment and acceptance for developing an environmental policy within BZU. Commitment is not an easy saying, but requires firstly a self convincing of the new environmental concept. So, type of

the questions of this category asks in a direct way about the opinion of the BZU community for developing a policy upgraded in the future to a management system.

Using recyclable materials is recently a new technique used to reduce environmental impacts and reduce resource consumption and eliminate cost. Employees with 70% agreed to use recyclable materials 43% of students agree to use them. It seems that less awareness of the importance of using recyclable materials by students, or may be students are not aware of the presence of recyclable materials.

Separation system of materials at source (papers, plastics, glasses, food…) in the central cafeteria and the campus can be a useful method in order to implement a recycling program at university. An acceptance for that idea is appearing by 94% of employees and 80.4% of students.

To manage all the BZU environmental issues and coordinate between the various departments there is a need to have an environmental office for the university with the majority of opinions by 88% for both employees and students.

If compulsory course named "Environmental Science and Engineering" is offered ,58% of employees and 57.2% of students will register for it. It seems that the topic of this course is complicated for students who actually will register for that course. For Arts, Commerce, Law and even graduate studies may choose it as an elective.

Environmental policy has a wide acceptance by 98% of employees, 51% are administrative and 49% are academic. Students with 92% a total in which 91.5% males, 92.4% females. That awareness of the community of BZU becomes a need in order to develop environmental policy based upon the university situation and regulate the environmental activities of BZU.

Adopting an environmental policy is the first step of having and implementing an EMS at BZU. Therefore , when establishing an EMS as a new system to university society , it needs to be well discussed and absorbed by the community of the university by making workshops

and lectures about it. 82% of employees and 60.64% of students agreed to attend such workshops.

When having an environmental management system including a clear environmental policy there should be environmental rules to control the environmental situation at university. Commitment for these rules is high through 92% of employees and 85.28% of students.

Commitment is not only a word to have the satisfaction of any other party, but a need to work hard in order to adapt with any new rules of EMS. Therefore, implementing new environmental rules may require from any member of BZU community to change some habits to be within the limits of the new system. Employees with 98% seem to have the potential of changing any habit that may be out of the range for the EMS. On the other hand 83.94% of students agree to adapt to the new system.

For any system there should be rules to control an honest implementation of it. Rules include interrogations for any member who violates these rules. Employees with 74% and students with 76% agree that commitment needs a taskforce implementation.

According to the financial phase of the EMS system which needs a certain budget to be implemented and according to the financial situation at BZU, then there should be a kind of assessment from the community of BZU to support the new system. If it is needed to cut a certain percentage (0.5-1%) of salaries or registration fees for EMS implantation 60% of employees and 53.6% of students agree for that idea. These percentages may change when implementing EMS, where many students face difficulties in paying their course fees, so any new fee may be refused.

“Preserving the land is more difficult than having a land” is a critical saying, in other words, how much our mentality is ready to look after our land which contains all the activities of daily activities of our society. There is an obvious difference between developing countries and modernized countries not only by the way of living but with the level of thinking and their respect for the rules to maintain the land. Employees with a 90% and 87.6% of students agree. This is an encouraging result but needs not only to agree but to implement.

4.3 Questionnaire Statistical Analysis

This part deals with the correlations of the questions that were asked before, where all BZU community will be considered without divisions between employees and students. No hypothesis were considered, key questions of the three main questions were correlated in order to show how much they are significant.

4.3.1 Relation to Environmental Activities

For the questions of this category, selected key questions were correlated in order to show the relationship of pair questions.

Table 4.7 Solid waste and WWTP correlations

		Solid waste	WWTP
Solid waste	Pearson Correlation	1	.092
	Sig. (2-tailed)	.	.111
	N	300	300
WWTP	Pearson Correlation	.092	1
	Sig. (2-tailed)	.111	.
	N	300	300

Correlation is significant at the 0.05 level (2-tailed).

By using Bivariate correlation, the relation between the persons who know how and where solid wastes are disposed off at BZU, and the awareness where is the WWTP at BZU is significant with a correlation coefficient of 0.092 .

Table 4.8 Green areas and Agricultural Irrigation correlations

		Green areas	Agricultural Irrigation
Green areas	Pearson Correlation	1	.026
	Sig. (2-tailed)	.	.653
	N	300	300
Agricultural Irrigation	Pearson Correlation	.026	1
	Sig. (2-tailed)	.653	.
	N	300	300

Correlation is significant at the 0.05 level (2-tailed).

The correlation between persons who think that BZU need more greening areas and those who think that treated water can be used for agricultural irrigation is significant with correlation coefficient 0.026.

4.3.2 Awareness of to Environmental Issues

For the questions of this category, selected key questions were correlated in order to show the relationship of pair questions.

Table 4.9 Environmental conditions and few information correlations

		Environmental Conditions	Few Information
Environmental Conditions	Pearson Correlation	1	.039
	Sig. (2-tailed)	.	.497
	N	300	300
Few Information	Pearson Correlation	.039	1
	Sig. (2-tailed)	.497	.
	N	300	300

Correlation is significant at the 0.05 level (2-tailed).

The correlation between persons who have information about environmental knowledge and those who think that there is little information about environmental knowledge at BZU, is significant with correlation coefficient of 0.039.

Table 4.10 Internet use ad EMS correlations

		Internet	EMS
Internet	Pearson Correlation	1	.056
	Sig. (2-tailed)	.	.318
	N	300	300
EMS	Pearson Correlation	.058	1
	Sig. (2-tailed)	.318	.
	N	300	300

Correlation is significant at the 0.05 level (2-tailed).

The correlation between persons who use internet for more than one hour daily, and those who heard about EMS, is significant with correlation coefficient of 0.056.

4.3.3 Acceptance and Commitment to Develop EMS

Finally, for this category, selected key questions were correlated in order to show the relationship of pair questions.

Table 4.11 BZU policy and commitment correlations

		BZU Policy	Commitment
BZU Policy	Pearson Correlation	1	.034
	Sig. (2-tailed)	.	.511
	N	300	300
Commitment	Pearson Correlation	.034	1
	Sig. (2-tailed)	.511	.
	N	300	300

Correlation is significant at the 0.05 level (2-tailed).

The correlation between persons who think that BZU need an environmental policy and those who are ready to commit themselves for any new environmental rules, is significant with correlation coefficient of 0.034.

Table 4.12 BZU policy and commitment correlations

		Percentage	Land
Percentage	Pearson Correlation	1	.055
	Sig. (2-tailed)	.	.340
	N	300	300
Land	Pearson Correlation	.055	1
	Sig. (2-tailed)	.340	.
	N	300	300

Correlation is significant at the 0.05 level (2-tailed).

The correlation between persons who accept to cut a certain percentage of their salaries or registration fees for EMS system at BZU and those who think that preserving the kand is more difficult than having a land, is significant with correlation coefficient of 0.055.

4.3 Suggesting EMS at BZU as a Case Study

4.3.1 Birzeit University Environmental Policy

Birzeit University is committed to the principle and practice of environmental protection, maintaining and improving the quality of environment for the people who live and work in

the University. The University seeks to manage its activities, buildings and estates to promote environmental sustainability, to make the most effective and efficient use of all resources, to prevent pollution and to bring about a continual improvement in its environmental performance. The responsibility for setting the Environmental Policy rests with top environmental management, which includes the Vice President of Administration and Finance and the Director of EMS. This management group is responsible for implementing the policy, and for providing input to the formulation and modification of the policy.

Aims

- Reduce consumption and costs whilst satisfying the University's needs for energy and water.
- Reduce the environmental impact of the University through better management of its material resources.
- . Integrating environmental and sustainable principles into the University's operational procedures and promoting best practice at every level.
- Continually improving environmental performance wherever practicable.

Objectives

- To promote sound environmental management policies and practices throughout the university
- To comply with the requirements of relevant legislation
- To make efficient and environmentally responsible use of energy and water
- To promote environmentally responsible procurement of goods and services
- To minimize waste and pollution, and to operate effective waste management procedures by implementing a waste minimization/recycling program.
- To maintain all noise within national guidelines & to reduce levels, as far as is practical, to a minimum.
- To encourage modes of transport by staff and students which minimize the environmental impact.

- To introduce sustainable construction principles to all new build, extension and refurbished buildings.
- To raise awareness of staff and students of the University's environmental impact, activities and performance and sustainability objectives more widely and to promote individual good practice.

4.3.2 Environmental Aspects of BZU

Operations and activities conducted at Birzeit University are primarily of an academic nature. However, activities in various laboratories (chemical, biological, radiological, and photographic), health services, athletic activities, and operations and maintenance of campus facilities entail handling of chemicals and generation of wastes. Some of these activities require the delivery, storage, and use of hazardous materials, the generation of hazardous wastes, and the release of pollutants to the media (e.g. air emissions). The "environmental aspects" are those operations and activities at Birzeit University that have the potential to impact the environment if not managed properly and in compliance with the applicable rules and regulations. The key environmental aspects of Birzeit University are summarized in (Table 4.13).

Table 4.13 Environmental aspects and impacts

Environmental Aspects and Impacts		
Activity	**Environmental Aspects**	**Environmental Impacts**
Office Activities	Use of paper	Use of natural resources
	Use of energy	Use of natural resources; air quality degradation
	Harmful chemicals	Health and environmental effects
	Solid waste	Degradation of land, drinking water.
	Production of odors	Indoor air quality
Food Service	Electricity Use	Air pollution
	Water Use	Resource consumption
	Solid Waste	Land filling
	Food waste	Land filling
Construction	Construction materials	Occupying Space
	Hazardous materials(fiber glass, Asbestos)	Danger for Land filling
Laboratories Use	Air emissions from vented lab hoods.	Degradation of air quality from emissions from vented

		lab hoods.
	Chemical Spills.	Potential for human exposure from chemical spills.
	Storage of potentially reactive chemicals in refrigerators.	Potential for chemical reaction from refrigeration equipment failure.
	Chemicals stored, used and handled past their expiration dates.	Potential for chemical reaction from mismanagement of expired chemicals.
Energy Use	Electricity Use	Air pollution
	Water Use	Resource consumption
	Heating& Cooling	Air pollution
Transportation	Vehicles Use	Air pollution
	Parking areas	Occupying Space
Treatment Plant	Treating waste water	Reduce Pollution
	Treated water	Agricultural Irrigation
Human activities	Using Loud Speakers	Making Noise
	Smoking cigarettes	Human Health Risk

4.3.3 Legal and Other Requirements

A top priority of EMS is to ensure that BZU maintains regulatory compliance. EMS needs to be able to access, identify and keep track of relevant legal and other requirements. In addition, EMS needs to be able to keep tack of any changes to these requirements, and then communicate this information to its staff, faculty and students in a timely manner. Regulations can exist in several forms including those specific to the activity, those specific to BZU activities or services, those specific to higher education institutions, and general environmental laws, authorizations, licenses and permits. Information that can be used to identify environmental regulations and changes may include all levels of government, industry associations or groups, commercial databases, journals or newsletters, and professional services (Table 4.14).

Table 4.14 Legislation of BZU

Legislation of BZU
Keep up to date on changing legislation – training, journals, law bulletins
Implement procedures to ensure compliance with new, and changes to current, environmental legislation
Continually update the University's environmental legislation register defining roles and responsibilities in relation to environmental legislation

Undertake any actions arising from the environmental legislation register
Notify departments of any instances of non-compliance with environmental legislation and advise on remedial action
Provide information/training on the correct procedure for completing Duty of Care forms for all waste disposal (e.g. skips)
Provide information and/or training for staff on their responsibility under the Duty of Care regulations
Implement disposal procedures in relation to changes in the categorization of Solid Waste
Investigate how the standard regulations will affect the University and implement any necessary procedures to ensure compliance
Investigate procedure for the monitoring of compliance with environmental legislation

4.3.4 Objectives and Targets

BZU's environmental policy should be met by establishing environmental objectives and targets for the University. Environmental objectives are overall goals for environmental performance. Environmental targets are descriptions of how environmental objectives will be achieved within a specific timeframe and should be specific and measurable.

The implementation of environmental objectives and targets by Birzeit University has to formulate an approach to environmental impact reduction and pollution prevention.

Birzeit has to review and update environmental objectives and targets which are important to the goals of Birzeit to student education, and in support of research according to its environmental policy.

Table 4.15 BZU's Objectives and Targets

BZU's Objectives and Targets	
Objective	**Target**
To conserve the use of water	To establish a water conservation programme to save water(by 30% in 5 years) during using water saving devices, raising the awareness of employees and students, collection of rain water.
Reduce energy usage	Reduce electricity use by 10% in 5 years Reduce heating fuel use by 15% in 5 years Continue the energy awareness and action programme.

	Review the University Energy Policy
Improve solid waste management	Establish scheme for recycling/disposal of solid wastes to 30 % (including food waste) by 3 years. Establish a procedure to use recycled paper in 2 years.
Manage University activities in an environmentally sustainable fashion.	Engage in the design and construction programme to advise on specific sustainability issues in relation to new buildings. Continue to identify opportunities to preserve and enhance biodiversity for University developments.
Improve employee awareness of environmental issues	Hold monthly awareness training course train 80% of employees in two years

4.3.5 Environmental Management Programs

The Environmental Management Programs should identify the objectives, targets, priorities, schedules, required labor, budgets, equipment and material resources, personnel responsibilities, and performance criteria in meeting the environmental objectives either directly, or through reference to other documents or systems. The Environmental Management Programs should be as specific as possible regarding the actions necessary to achieve the environmental targets. The program should be dynamic and revised regularly to reflect changes in EMS objectives and targets.

For the first year of this plan, the goal is to properly implement the EMS plan at Birzeit Since the EMS Manual is a "living and breathing" document, the EMS Committee shall make changes to adjust to compliance measures based on new regulations, materials and units.. Any student, faculty, staff member, or other interested party may provide suggestions to the improvement of the EMS plan to the EMS Committee. However, the EMS Manager will have the final authority concerning any modifications to the Manual.

4.3.6 Resources, roles, responsibility and authority

How various functions can support EMS in Birzeit University

Table 4.16 Various Functions Can Support EMS in Birzeit University

Functions	How They Can Help (Possible Roles)
Purchasing	• Develop and implement controls for materials purchases

Human Resources	• Define competency requirements and job descriptions for various EMS roles • Train temporary workers and contractors; maintain training records • Integrate environmental management into reward, discipline
Maintenance	• Implement preventive maintenance program for key equipment • Support identification of environmental aspects
Finance	• Track data on environmental-related costs (such as resource, material and energy costs, waste disposal costs, etc.) • Prepare budgets for environmental management program • Evaluate economic feasibility of environmental projects
Engineering	• Consider environmental impacts of new or modified products and processes • Identify pollution prevention opportunities
Top Management	• Communicate importance of EMS throughout university • Provide necessary resources • Track and review EMS performance
Quality	• Support document control, records management and employee training efforts • Support integration of environmental and quality management systems
Line Workers	• Provide first-hand knowledge of environmental aspects of their operations • Support training for new employees

4.3.7 Training, awareness, and competence

The office of the EMS Manager will be responsible for providing the initial orientation of the environmental policy, targets and objectives and the EMS Manual to all participants of the EMS plan including Deans of Colleges, students, faculty and staff. Following the orientation, a training program will be implemented on a periodic basis. Any modifications and/or revisions to the existing targets and goals, and the EMS plan due to changes in the environmental practices, use of materials, or driven by environmental regulations will be communicated either via official website or training classes.

Information provided to students, faculty and staff will cover:

- contents of the rule

- contents of Birzeit's EMS plan, including
  - location and availability of the EMS Plan
  - location of complete set of standard operating procedures
- emergency response measures
- spill prevention countermeasure and containment plan
- chemical hygiene plan
- signs and indicators of a hazardous substance release
- relevant reference material
- record keeping procedures
- other applicable training requirements

In addition, the training for students, faculty and staff of various colleges will include the following information:

- methods and observations used to detect the presence or release of a hazardous material
- chemical, biological and physical hazards associated with laboratory wastes in their work area
- relevant measures one can take to protect human health and the environment
- details of this EMS Plan to ensure wastes are managed in accordance with this rule
- pollution prevention opportunities

4.3.8 Record keeping

Training materials are to be kept on file at the Office of the EMS Manager as well as the relevant department. The records will include but not limited to the training records such as, the agenda, materials used in training, the name of the instructor, the attendees, the date, and the location. Each College will maintain a list of the faculty and their laboratories or classes (identified by Building and Room number). A copy of this list shall be forwarded to the office of the EMS Manager.

4.3.9 Communications

This procedure should apply to all internal communication between the various levels and functions of BZU and to the receiving, responding, and documenting of relevant communication with external interested parties. In addition, it should apply to any processes

that are considered for external communication of EMS significant environmental aspects, objectives and targets, and to the recording of those decisions.

Communication should include establishing processes to report internally and externally on the environmental activities of EH&S in order to:

- demonstrate EMS commitment to the environment
- deal with concerns and questions about the environmental aspects of EMS activities, processes or services
- raise awareness of EMS Environmental Policy, objectives, targets and programs
- inform internal or external interested parties about EMS and environmental performance as appropriate

Internal Communications:

The selection of the most appropriate mechanism(s) used for internal communication is left to the discretion of the responsible Program Manager. Mechanisms that are used for various types of internal communication include, but are not limited to:

- staff meetings
- new employee training
- EH&S meetings with BZU facility and site personnel
- student classes
- bulletin boards and posters
- newsletters, articles and
- BZU web site (www.birzeit.edu)

External Communication:

External communication methods may include**:**

- focus groups
- press releases
- annual reports
- newsletter and articles
- informational brochures
- advertising

- presentations at conferences

To ensure continual improvement, EMS should solicit the views of faculty, staff, students, regulatory agencies and other interested parties on its EMS, its environmental performance, and other related matters. In particular, such outreach should be conducted through involvement with BZU's Environmental Science and Regional Planning students when applicable. When significant changes at the University are being considered (such as expansions, changes in major policies or procedures, or other actions that might affect the actual or potential environmental impacts of BZU's activities, processes or services) the views of interested parties should be solicited.

4.3.10 Documentation

University can maintain EMS documentation either on paper or electronically. There may be some advantages to maintaining documents electronically, such as ease of updating, controlling access, and ensuring that all readers are using the most up-to-date versions of documents.

What Constitutes EMS Documentation?

- Environmental policy, objectives and targets.
- Description of the scope of the EMS
- Description of the mail elements of the EMS and their interaction, and reference to related documents.

4.3.11 Document Control

Documents, including records, determined by the university to be necessary to ensure the effective planning, operation and control of processes that relate to its significant environmental aspects.

Controlled documents should be centrally located at university, usually under the control of the EMS Manager. In addition, controlled documents should have the following features:

- Effective date
- Approval signature and date
- Copy number (if more than one controlled copy is required)

What EMS documents should be controlled?

- Environmental policy
- Objectives and targets
- Roles, responsibilities and authorities
- EMS description document ("manual")
- System-level procedures
- Process- or activity-level procedures / work instructions
- Related plans (such as emergency response plans)

4.3.12 Emergency Preparedness and Response

Emergency plans and procedures should be developed and maintained at BZU to ensure that there will be an appropriate response to abnormal operating conditions, accidents and potential emergency incidents. These identify the potential for, and procedures for prevention of, such incidents (to the extent reasonably possible). They comply with applicable regulatory requirements and define procedures for minimizing and mitigating environmental impacts that may be associated with the incidents.

These plans and procedures should include:

- BZU's Emergency Response Plan
- BZU's Safety Policies and Procedures Manual
- EH&S Plans and Procedures
    - Preparedness and Prevention and Contingency Plan
    - Dangerous Waste Generator Personnel Training Program
    - Emergency Response Procedures for EH&S Personnel
- *Laboratory Safety Manual*

4.3.13 Operational Control

Part of this evaluation process should be to ensure that the procedures or controls comply with defined "Operational Control Specifications". If a procedure is needed, then it must meet the following conditions:

- The procedure is established and documented

- The procedure is maintained, reviewed and updated at least once a year
- Operating criteria are stipulated in the procedure
- The procedure is communicated with suppliers and contractors (were applicable)
- *The procedure is in line with environmental requirements (which include the Environmental Policy, objectives and targets).*

4.3.14 Monitoring and Measurement

Suggested campus metrics to be monitored and measured are summarized in (Table 4.17)

Table 4.17 Campus Metrics

Metric	**Description**
Energy use	Energy (electricity, natural gas, or other power source) is a primary resource used by university. It is important to track energy use to estimate equivalent CO_2 emissions and the university's contribution to greenhouse gases. Tracking energy use is also necessary to realize the results of conservation practices.
Water use	Water is an important natural resource used by university and can be significantly reduced through conservation practices. Additionally, water use in laboratories relates to wastewater generation and water use in landscaping contributes to pesticide and fertilizer runoff.
Laboratory hazardous wastes	Hazardous waste generation from laboratories is likely the greatest health and safety and compliance concern for university. Because laboratories are often scattered throughout the campus, it is important to develop a consistent approach that will include a measuring and monitoring program that reflects the activities for the entire campus.
Computer/IT wastes	University often strives to utilize the latest technologies. Often, computers and other information technology products have a short lifespan, which creates a significant source of waste that may be subject to special disposal requirements. This issue is

	relatively new to all industries.
Construction- and renovation-associated wastes	University campuses are constantly improving existing facilities and building new ones. Construction- and renovation-associated wastes are a significant concern, but often difficult to measure. Also, this waste is often managed by the contractor, in which case it is important to set measuring and monitoring expectations at the beginning of the project.

4.3.15 Nonconformance, Corrective and Preventive Action

The findings, conclusions and recommendations reached as a result of measuring, monitoring, audits and other reviews of the environmental management system should be documented, and the necessary corrective and preventive actions should be identified. The Director of EMS and Program Managers should ensure that these corrective and preventive actions have been implemented and that there is a systematic follow-up to verify their effectiveness

4.3.16 Control of records

Training materials are to be kept on file at the Office of the EMS Manager as well as the relevant department. The records will include but not limited to the training records such as, the agenda, materials used in training, the name of the instructor, the attendees, the date, and the location. Each College will maintain a list of the faculty and their laboratories or classes (identified by Building and Room number). A copy of this list shall be forwarded to the Office of the EMS Manager on a bi-annual basis or whenever a change occurs.

4.3.17 EMS Audits

EMS Audits are to be conducted annually, and typically conducted by a trained auditor or an audit team. The EMS Manager should not be a part of the audit team. The Lead Auditor should be an outside consultant to conduct audit. The primary responsibilities of the Lead Auditor will include:

- provide orientation of audit procedures and documentation requirements to the audit team.
- provide orientation concerning the EMS, environmental policy, targets and goals.

- maintaining records of EMS audit findings, trained auditors and their training records, audit schedules, protocols, and reports.
- conducting pre-audit meetings, coordinating audit schedules, and conducting the post-audit conference.
- preparing the EMS audit report.

The audit team member should closely work with the Lead Auditor in coordinating, scheduling and maintaining corrective action database. The primary responsibilities of this individual will include the following:

- prior notification to EMS auditors and if so decided, prior notification to the Departments of any upcoming audits within a reasonable time frame.
- participate in the audit.
- ensuring that Corrective Action Notices are prepared for audit findings whenever appropriate or necessary.
- maintenance of the Corrective Action Database.
- distribution of the EMS Audit Report to participating departments upon completion of the audit.
- document retention.

4.3.18 Management Review

Management should review the EMS at regular intervals to determine its adequacy and performance. These reviews assist the continual improvement process and may result in changes to the policies, objectives, and procedures. Following questions are recommended:

- Did we achieve our **objectives and targets**? If not, why not? Should we modify our objectives?
- Is our environmental **policy** still relevant to what we do?
- Are **roles and responsibilities** clear, do they make sense and are they communicated effectively?
- Are we applying **resources** appropriately?
- Are our **procedures** clear and adequate? Do we need other controls? Should we eliminate some of them?
- Are we **fixing problems** when we find them?

- Are we **monitoring our EMS** (e.g., via system audits)? What do the results of those audits tell us?
- What effects have **changes in materials, products, or services** had on our EMS and its effectiveness?
- Do changes in **laws or regulations** require us to change some of our approaches?
- What other changes are coming in the near term? What impacts (if any) will these have on our EMS?
- What **stakeholder concerns** have been raised since our last review? How are concerns being addressed?
- Is there a better way? What can we do to improve?

4.3.19 Suggested Organizational Chart

To have a well organized EMS system, there should be a structure for the responsibilities to facilitate the implementation of EMS.

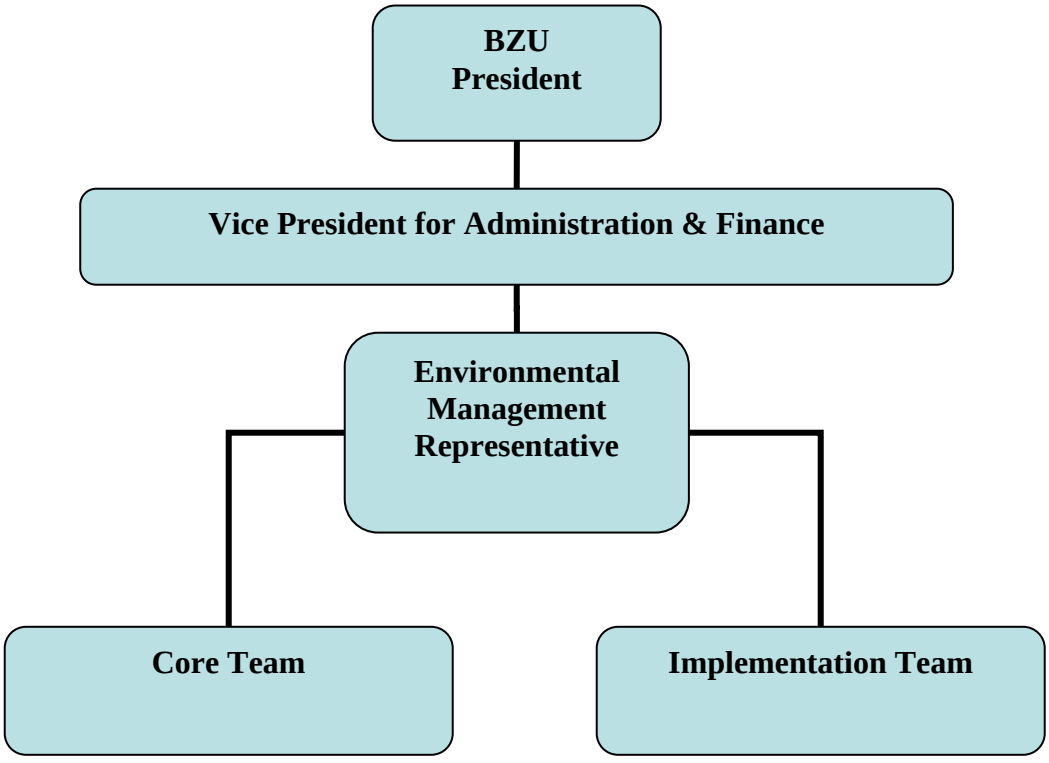

Figure 4.4 Organizational chart for EMS

Chapter Five

Suggested Approaches for EMS Implementation

Approaches to facilitate implementing EMS at BZU were divided into managing level and a technical level, according to the results of the questionnaire.

5.1 Managing Level

To have a well organized environmental management system at BZU, there should be an Environmental office as an independent department. This office can regulate the environmental activities within university. For this office, an environmental management representative (EMR) should lead this office.

5.1.1 Identifying an Environmental Management Representative

The EMR is the clearly identified EMS team leader who has responsibility of implementing the EMS from start to finish. The EMR is the Project Manager and has the designated authority of senior managers to get the job done. Environmental manager has an extremely varied workload. Traditionally areas for day-to-day management included waste management, utilities conservation, and legal compliance. However, emerging legislation and external drivers are beginning to require environmental managers to consider issues such as sustainable procurement, construction, environmental reporting (Winsum, 2004).

Typical Responsibilities

- Build and lead the EMS Core Team
- Plan the EMS project and implementation schedule
- Be the “internal consultant”
- Report to top management
- Gather, organize, and disseminate information
- Delegate tasks and establish deadlines
- Collect and evaluate work
- Organize training
- Facilitate top management visibility and involvement
- Obtain cross-functional support and buy-in

Certain qualifications and attributes of an EMR can contribute significantly to the likelihood of successfully implementing an EMS.

Qualifications

- Knowledge of overall operations
- Excellence in project management
- Excellent organizational skills
- Good communicator up and down the ladder
- Available, enthusiastic, and committed
- Trusted by employees and managers

5.1.2 Selecting a Core Team

The Core Team has a vital leadership role in planning the EMS project, delegating the tasks, establishing deadlines, collecting and evaluating the work, and providing training, guidance and assistance where needed. The Team members are the organization's EMS experts and stakeholders. Some participants enlisted volunteers for their Team; others made assignments. Team may vary in structure and in size. Team members should have sufficient organizational knowledge and authority in their respective departments. The entire team needs in-depth EMS training and a clear understanding of their roles and responsibilities in order to plan and lead the implementation effort.

The Team functions in an advisory capacity, developing the project plan, enlisting buy-in from employees, collecting EMS information and disseminating it across the organization, and providing guidance and leadership as the requirements are being addressed. Members of the core team should be from different specializations such as; health and environment, water engineering, chemistry, economic, statistics, social science.

Typical Responsibilities

- Gather, organize, and disseminate information.
- Delegate EMS tasks and general responsibilities.
- Collect and evaluate the work.
- Advise, coordinate and facilitate.
- Manage reaction to change.

5.1.3 Selecting an Implementation Team

Individuals within the organization who are closest to the actual workflow and who assist the core team and the EMR in better understanding operational activities. Implementation Team are generally very involved in designing operational controls, testing emergency preparedness , response plans and identifying the environmental aspects of their daily activities

Activities addressed at this level can include:

- Documenting the organizational activities/operations as process flow diagrams.
- Assisting with the identification of environmental aspects.
- Providing input on environmental objectives.
- Developing work instructions or standard operating procedures for activities or operations with significant environmental aspects.
- Disseminating information and good news about the EMS effort – acting as EMS champions for their area of operation.

5.2 Technical Level

During collection and analyzing of data for this thesis concerning the environmental activities at BZU, it was noticed that there is some kind of arrangement of these activities, but with poor technical organization. The followings are detailed methods that can help in the reduction of the negative impacts that are related to the environmental activities at BZU.

5.2.1 Energy Reduction

5.2.1.1 Reduction of Electricity Use

The following tips are suggested methods that can be used to reduce electricity consumption of university, which increases every year.

- Turn off lights and equipment when not in use.
  Turn off electric lights when they are not needed and take advantage of natural daylight whenever possible. Turn off office equipment at night and on weekends, or install timers.

- Install the most efficient lighting equipment and incorporate control devices.
  Install lighting control systems, including day lighting controls, occupancy sensors and timers.

- Install variable speed drives.
  Fans, pumps, refrigeration equipment, and compressors do not need to operate at full power all the time. Variable frequency drives (VFD) control the speed of the motor that drives this equipment so that the motor's speed is matched to the actual equipment load, allowing the motor to be continually adjusted.

- Program thermostats correctly
  Adjust the thermostat down in winter and up in summer. Even a few degrees can significantly reduce heating and air conditioning costs.

- Monitor monthly energy bills
  An unexpected change in peak demand or energy use can indicate that something is not working properly or has inadvertently been left on.

- Computers and IT
  - Buy a laptop instead of a desktop, if practical. It consumes five times less electricity.
  - Get an LCD screen instead of an outdated CRT.
  - Enable the power management function on computer, the screensaver does not save energy. Switching off a computer extends its lifetime, contrary to some misconceptions.
  - Minimise printing. Laser printers use more electricity than inkjet printers.
  - Using renewable energy to produce electricity such as solar Photovoltaic system.

5.2.1.2 Managing The Condition System

Heating and Cooling Temperature Adjustment Tips

• Set Programmable thermostat as low as is comfortable in the winter and as high as is comfortable in the summer.

- In the heating season, set thermostat at 20 ^{0}C instead of 22 ^{0}C or lower during the day, Savings: 5 percent to 10 percent of space heating costs.
- In the cooling season, set thermostat at 25 ^{0}Ç or higher, health permitting. Savings: 10 percent to 20 percent of cooling costs.
- Save 5 percent of the energy used for every degree you raise the thermostat (if it's set between 70 and 82 degrees).

WINTER TIPS

- Open inside Doors To Improve Air Circulation
- Choose High-Efficiency Furnace And Boiler Systems
- Keep furnace clean, lubricated and properly adjusted, replace furnace's air filter before the heating season begins.
- Plug gaps around pipes, ducts, fans and vents that go through walls, ceilings and floors from heated to unheated spaces.
- Have ducts tested for air leakage.
- Use Variable speed motors and compressors.
- Don't close registers in unused rooms: where condition system can't handle the extra pressure.
- Do not use electric space heating .

Tips to Raise Efficiency for Boiler:

A complete cleaning and tuning involves:

• Removing the burners and cleaning them.

• Cleaning the heat exchanger.

• Removing the vent and boiler jackets to inspect the seams of the heat exchanger and sealing them if necessary.

• Draining the expansion tank.

• Bleeding the radiators and refilling the system to proper pressure.

Summer Tips

- Change Air Conditioning filter.
- Keep Air Conditioner coils dust-free.
- Provide Shading for Air Conditioning Condenser
- Use Ceiling Fans for Cooling
- Be sure to seal any gaps between the unit and the window.

5.2.2 Reduction of Water Use

The simplest way to conserve water is to change water-use habits so that water is used more efficiently, reducing BZU's overall water consumption. These practices require simple changes in behavior, not major modifications in the BZU's existing plumbing or fixtures.

Water conservation methods may go beyond simple behavior modification suggestions, such as equipment replacement or alterations. Often, small, inexpensive equipment replacements or modifications can mean big long-term savings, not only of water, but also of money and time.

Toilets Saving Tips

- Do not let the water run when washing hands.
- Install faucet aerators to reduce water consumption.
- Install low-flow aerators and showerheads.
- Fix dripping and leaking faucets and toilets, a faucet leaking 30 drops per minute wastes 54 gallons a month.
- When establishing a new building, install a new low-volume flush toilet that uses only 1.6 gallons per flush.
- Test toilets for leaks.
- Never use the toilet as a trash can for cigarette butts, cleansing tissues or other trash. This not only wastes water but also places an unnecessary load on the sewage treatment plant.

Water-Saving Garden Tips

- Water only when needed. Look at the grass, feel the soil, or use a soil moisture meter to determine when to water.

- Water early in the morning. Otherwise, much of the water will simply evaporate between the sprinkler and the grass.
- Use a sprinkler that produces large drops of water rather than a fine mist, and sends the droplets out on a low angle, to avoid evaporation.
- Use drip irrigation systems for bedded plants, trees and shrubs.
- Water slowly for better absorption, and never water on windy days.
- Fertilize lawns at least twice a year for root stimulation.
- Use a watering can or hand-water with the hose in small areas of the lawn that need more frequent watering. (near walks or driveways or in especially hot, sunny spots.)
- Use water-wise plants. Choose plants that have low-water requirements, are drought tolerant, and are adapted to the area of university where they are to be planted.
- Consider decorating some areas of the lawn with wood chips, gravel or other materials available that require no water at all.

5.2.3 Solid waste Reduction

The most environmentally sound means to manage waste is through waste reduction methods. Waste reduction focuses on reusing materials and reducing the overall amount of wastes produced. Reuse prevents the need to consume new materials and prevents the environmental effects associated with producing those materials. Reduction, on the other hand, prevents the need to use a product. The environmental benefits (James and Winsum, 2004) are:

- Environmental benefits reduced throughout the life cycle - extraction, production, distribution, and disposal.
- Less clutter and less filing.
- Less mailing and potentially less handling costs.
- If made available through economic means, more efficient access.

5.2.3.1 Minimize Paper Use

The most usable solid waste in the campus is paper. A green office should not only recycle, but also include a strategy to reduce and reuse paper before ultimate disposal. Careful use and reuse of paper offers financial advantages as well as environmental benefits. In order to reduce the amount of paper, encourage staff and students to:

- Use spell check and print preview before printing a document to avoid needless waste of paper.
- Use a smaller font; reduce line spacing and margins to save paper.
- Double-side all photocopying and printing where appropriate.
- Print two pages or more on one sheet .
- Reuse paper in printers and photocopiers.
- Circulate one copy of memos, minutes etc or use email.
- Use the back of scrap paper - for internal notes or as a note pad.
- Ensure that fax machines do not produce header or report sheets unless absolutely necessary.
- Not print out emails, use an electronic filing system by developing a filing system on computer , so that paper copies are not needed.
- Use email instead of sending letters by post.
- Reduce standard margin settings instead of left, right=1.25" and top, bottom=1". If all the margins are reduced to 0.75", 19% more area is available for text in a given page of an "ideal" document. This can be empirically demonstrated by changing the margins on a 100-page document from the status quo to 0.75", thereby reducing it to only 81 pages (Penn state council, 2005).
- If possible, using recyclable papers.

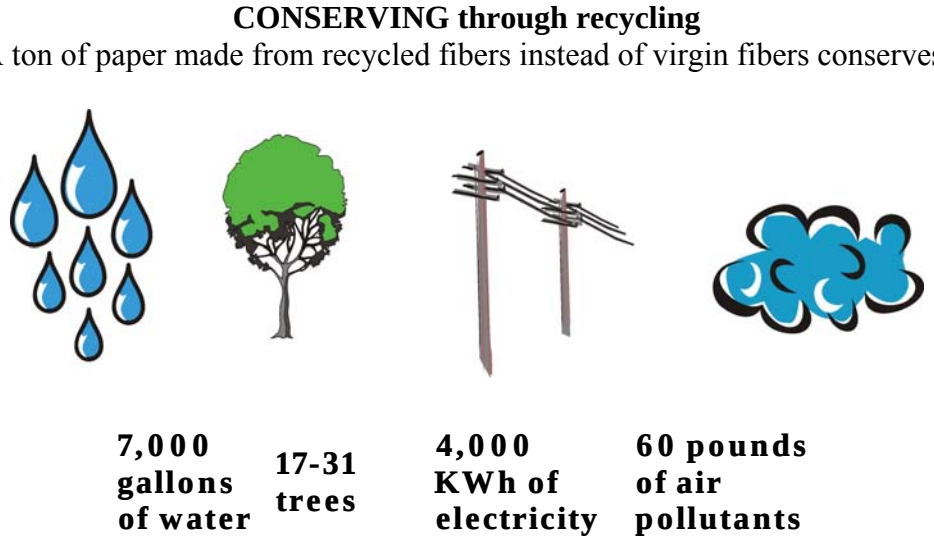

Figure 5.1 Conservation through recycling

Recycling of each ton of paper saves 17 trees and 7000 gallons of water (Eco Elements, 2005**)** (Figure 5.1).

5.2.4 Reducing Transportation Impact

Transportation can bother the movement of students, so who own a private car can use the public transportation to reduce the number of cars within the campus. Employees and students who live beside BZU in Birzeit city can walk if possible according to their time this can make them feel better; walking can improve health and reduce stress. They also can use bicycles to come to university. As a suggestion, private transportation can be prohibited for any selected day of the week.

5.2.5 Reducing Human Activities Impact

5.2.5.1 Health Aspects

According to questionnaire results, more than 70% of BZU community agreed to prohibit smoking under a roof in the campus for the dangerous effect of smoking especially in the cafeteria where many smokers like to smoke. There should be places for smokers, but isolated and vented by using vents where they can freely smoke without affecting nonsmokers.

5.2.5.2 Reducing Noise Impact

- Construction activities should be limited to a schedule that minimizes disruption to uses surrounding the project site as much as possible.
- Loudspeakers should be prevented from use within the yards, between and inside buildings and for any other purposes outside a closed hall where it should be used.
- Games should be held after 4:00 pm at the end of lectures and work, or in holidays.
- Manage the traffic, by using back roads for vehicles and making the parks behind buildings.

Chapter Six

Conclusions and Recommendations

6.1 Conclusions

6.1.1 The Environmental Activities at BZU

From the data collected, BZU has five environmental categories form the environmental activities; energy, water, solid waste, transportation and human activities.

An important reason for the continued high consumption of energy and water, generating an increasing amount of waste, increasing number of vehicles and more human activities, is the increasing numbers of students and staff, and consequently the construction of new buildings, where buildings area increased by 15660 meter square between 1995 and 2004.

6.1.2 Questionnaire Conclusion

6.1.2.1 Relation to Environmental Activities

BZU community:

- Need to know where how and where solid waste is disposed of.
- Aware that WWTP irrigates campus agriculture by treated water.
- Need more greening areas as an essential issue to be implemented.
- Smokers are not so many in the university.
- Need condition system to be readjusted, but attitudes have to be reviewed.
- Agree that loudspeakers should be used within closed halls.
- Say that parking areas should be outside campus.

As a result, BZU community relates to some its environmental activities that are visible and touched by. More illustrations and information are needed.

6.1.2.2 Awareness of Environmental Issues

BZU community:

- Has low percentage of people aware of the environmental conditions at BZU.
- Accept to prohibit smoking under a roof by the majority.
- Employees have the awareness of recycling benefits more than students.

- Need more environmental information illustrating actual status at BZU.
- Has poor knowledge about EMS.
- Has poor knowledge about ISO14001.
- Need adequate internal communications about EMS.
- Agree that there is little knowledge about environment.
- Aware of the relationship between Environment and Economy.
- Accept to have a university requirement concerning environment
- Has more than 50% of employees and students whom spend more than one hour on the internet per day.
- Aware of existing environmental policies at foreign universities.

Employees have the awareness more than students, more information about environmental issues BZU is needed.

6.1.2.3 Acceptance and Commitment to Develop Environmental Policy to Have EMS

BZU community:

- Employees accept using recyclable materials but students not.
- Accept for any separation system of materials at source by the majority.
- Agree to have an environmental office of BZU.
- Accept shyly for a compulsory course concerning environment.
- Agree by the overwhelming majority to develop environmental policy for BZU.
- Will attend workshops about EMS.
- Will commit to any new environmental rules.
- Can change any habit to cope with EMS rules by majority.
- Accept to have a taskforce implementation for rules.
- Has a shy acceptance for any financial contributions to EMS.
- Agree that preserving the land is more difficult than having a land.

There is an encouraging majority (93% of BZU community) which accepts to develop an environmental policy for BZU as a first step to adopt EMS.

6.2 Recommendations

- Applying EMS requires the awareness of BZU community for its benefits. That awareness leads to the acceptance of any new rules or regulations. BZU should focus on environmental issues besides academic goals.

- It is needed that EMS should be backed up by a responsible committee (An Environmental Office) supported by a task force. It is vital that the task force represents all sectors of the university, including students, academic and administrative employees.

- Develop an environmental policy in order to adopt an environmental management system of level two (Complete EMS Implementation without Certification) where Audits add more costs in applying a third party level.

- University can reduce its environmental impacts, reduce expenditure, and enhance image and reputation by applying managing and technical methods as suggested.

- Finally, one of the greatest impacts a university can have by the use of this research is in changing the values and attitudes of its students and employees. Thus the outcomes of a university's environmental management system can be amplified (beyond the immediate on-campus benefits) into the wider community.

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Appendix A
Number of Students and Employees

Table1 Numbers of Employees (Academic, Administrative) from 2001-2006
Source: Human Resource Department

	2001-2002	2002-2003	2003-2004	2004-2005	2005-2006
Academic	334	346	320	367	421
Administrative	367	361	349	370	378
Total	701	707	669	737	799

Table2 Numbers of Students (Male, Female) from 2000-2006
Source: Registration Department

Academic Year	Male	Female	Total
2000/2001	2900	2547	5447
2001/2002	2659	2660	5319
2002/2003	2510	2757	5267
2003/2004	3099	3215	6314
2004/2005	3434	3595	7029
2005/2006	3341	3754	7095

Table3 Number of Students by colleges (2001/2002 – 2005/2006)
Source: Registration Department

College	2001/2002			2002/2003			2003/2004			2004/2005			2005/2006		
	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T
Arts	609	979	1588	537	1037	1574	634	1204	1838	536	1232	1768	492	1254	1746
Commerce	448	579	1027	436	597	1033	520	644	1164	577	632	1209	611	653	1264
Sciences	436	390	826	376	398	774	428	481	909	449	582	1031	445	644	1089
Engineering	804	367	1171	754	376	1130	900	399	1299	1038	417	1455	1024	414	1438
Law	-	-	-	-	-	-	-	-	-	47	65	112	103	151	254
Special Programs	25	60	85	73	72	145	62	77	139	139	146	285	115	146	261
Graduate Students	320	268	588	322	268	590	533	389	922	624	497	1121	539	471	1010
Diploma	17	17	34	12	9	21	22	21	43	24	24	48	12	21	33
Total	2659	2660	5319	2510	2757	5267	3099	3215	6314	3434	3595	7029	3341	3754	7095

Appendix B
Questionnaire

BIRZEIT UNIVERSITY
Faculty of Graduate Studies
M.Sc. Program in Water & Environmental Engineering

Birzeit, 08.10.05

Developing an Environmental Management System for Birzeit University

This questionnaire is a part of a MSc. Thesis (WEEN 860)

Student Name: Munir Sa`d
Supervisor: Dr. Rashed Al-Sa`ed

Part 1: General Questions

Please put (x) within the brackets:

1- Sex
[ ] - Male [ ] - Female

2-If you are working at BZU, in what field?
[ ] - Academic [ ] - Administrative

3-If you are studying at BZU, your college is:
[ ] - Engineering [ ]-Science [ ]-Commerce [ ]-Arts [ ]-Law [ ]-Graduate studies

Part 2: Environment at BZU

Please put (x) under Yes or No questions	***Yes***	***No***
1- Do you have any information about environmental conditions at BZU?		
2-Do you know how and where solid wastes are disposed off at BZU? (solid wastes: rubbish, plastics, glass, paper, construction & food …)		
3- Are you aware that BZU do have a wastewater treatment plant at campus?		
4- If so, do you think the treated water can be used for agricultural irrigation of campus trees?		
5- In your opinion, does the university need more greening areas or trees?		
6- Are you a smoker?		
7- If there is a rule to prohibit smoking under a roof at BZU, will you agree?		
8- Are you satisfied with the condition system (Heating and cooling) at the university?		
9-Do you think that the loudspeakers used in certain activities make a noise?		
10-Do you think that parking areas (for cars) should be outside the campus?		
11- Have you any idea about solid waste recycling?		

13- Would you accept the separation system of materials at source (papers, plastics, glasses, food…) in the central cafeteria and the campus?		
14-Is there a need for an environmental office at BZU?		
15- Do you feel a need for more environmental info illustrating actual status at BZU?		
16- If compulsory course named "Environmental Science and Engineering" is offered, would you register for this course?		

Part 3: Environmental Management System (EMS)

EMS: is a systematic approach to the management of all of the environmental aspects of operating a business, organization or any entity that has impact on the environment.

Please put (x) under Yes or No questions	***Yes***	***No***
1- Have you heard about EMS?		
2- Do you know what the ISO 14001 is?		
3- In your opinion, does BZU need an environmental policy?		
4-Does BZU need adequate internal communications about EMS?		
5-Do you think that there is a few information about environmental knowledge?		
6-Are you ready to attend a workshop about implementing EMS at BZU?		
7-Do you think that there is a relationship between environment and economy?		
8-In your opinion, is it more beneficial to have a university requirement concerning environment instead of other courses?		
9- If there are environmental rules at BZU, are you ready to commit your self to?		
10-Are you ready to change some habits in order to adapt with any environmental rules?		
11- Are you with taking serious actions with any person who violates environmental rules?		
12- If it is needed to cut a certain percentage (0.5-1%) of your salary or registration fees for EMS system at BZU, will you accept?		
13-Do you spend more than one hour each day on the internet?		
14- Are you aware that foreign universities do have environmental policies?		
15- Do you think BZU should have one?		
16-Are you with the saying “preserving the land is more difficult than having a land”		

Appendix C
Questionnaire Results

Table5 Distribution of Employees (Male, Female)

	Female		Male	
	Count	**%**	**Count**	**%**
Academic	7	50.0%	18	50.0%
Administrative	7	50.0%	18	50.0%
Total	14	100.0%	36	100.0%

Table6 Distribution of students (Male, Female) of colleges

	Female		Male	
	Count	**%**	**Count**	**%**
Engineering	9	6.8%	40	33.9%
Science	22	16.7%	20	16.9%
Commerce	30	22.7%	8	6.8%
Arts	32	24.2%	6	5.1%
Law	19	14.4%	23	19.5%
Graduate Studies	20	15.2%	21	17.8%
Total	132	100.0%	118	100.0%

Table 7 Results of Employee's Questionnaire at BZU

Questions	Results			
Environment at BZU	**Y/N**	**AC%**	**AD%**	**Total%**
1- Do you have any information about environmental conditions at BZU?	Yes	45.8	54.2	48
	No	53.8	46.2	52
2- Do you know how and where solid wastes are disposed off at BZU?(solid wastes: rubbish, plastics, glass, paper, construction & food …)	Yes	47.4	52.6	38
	No	51.6	48.8	62
3- Are you aware that BZU do have a wastewater treatment plant at campus?	Yes	47.7	52.3	88
	No	66.7	33.3	12
4- If so, do you think the treated water can be used for agricultural irrigation of campus trees?	Yes	80	96	88
	No	16	0	8
	N/A	4	4	4
5- In your opinion, does the university need more greening areas or trees?	Yes	50	50	100
	No	0	0	0
6- Are you a smoker?	Yes	27.8	72.2	36
	No	62.5	37.5	64
7- If there is a rule to prohibit smoking under a roof at BZU, will you agree?	Yes	44.4	55.6	72
	No	64.3	35.7	28
8- Are you satisfied with the condition system (Heating and cooling) at the university?	Yes	42.9	57.1	28
	No	52.8	47.2	72
9- Do you think that the speakerphones used in certain activities make a noise?	Yes	45.2	54.8	84
	No	75	25	16
10- Do you think that parking areas (for cars) should be outside the campus?	Yes	62.5	37.5	32
	No	44.1	55.9	68
11- Have you any idea about solid waste recycling?	Yes	58.3	41.7	72
	No	28.6	71.4	28
12- If yes, will you use recyclable materials?	Yes	51.4	48.6	70
	No	57.1	42.9	14
	N/A	37.5	62.5	16
13- Would you accept the separation system of materials at source (papers, plastics, glasses, food…) in the central cafeteria and the campus?	Yes	48.9	51.1	94
	No	66.7	33.3	6
14- Is there a need for an environmental office at BZU?	Yes	50	50	88
	No	50	50	12
15- Do you feel a need for more environmental info illustrating actual status at BZU?	Yes	45.7	54.3	92
	No	100	0	8
16- If compulsory course named "Environmental Science and Engineering" is offered, would you register for it ?	Yes	44.8	55.2	58
	No	57.1	42.9	42

Questions	Results			
Environmental Management System (EMS)	**Y/N**	**AC%**	**AD%**	**Total%**
1- Have you heard about EMS?	Yes	45.5	54.5	22
	No	51.3	48.7	78
2- Do you know what the ISO 14001 is?	Yes	25	75	16
	No	54.8	45.2	84
3- In your opinion, does BZU need an environmental policy?	Yes	49	51	98
	No	100	0	2
4- Does BZU need adequate internal communications about EMS?	Yes	50	50	92
	No	50	50	8
5- Do you think that there is a few information about environmental knowledge?	Yes	51.1	48.9	90
	No	40	60	10
6- Are you ready to attend a workshop about implementing EMS at BZU?	Yes	48.8	51.2	82
	No	55.6	44.4	18
7- Do you think that there is a relationship between environment and economy?	Yes	49	51	98
	No	100	0	2
8- In your opinion, is it more beneficial to have a university requirement concerning environment instead of other courses?	Yes	45	55	80
	No	70	30	20
9- If there are environmental rules at BZU, are you ready to commit your self to?	Yes	47.8	52.2	92
	No	75	25	8
10- Are you ready to change some habits in order to adapt with any environmental rules?	Yes	49	51	98
	No	100	0	2
11- Are you with taking serious actions with any person who violates environmental rules?	Yes	43.2	56.8	74
	No	69.2	30.8	26
12- If it is needed to cut a certain percentage (0.5-1%) of your salary or registration fees for EMS system at BZU, will you accept?	Yes	50	50	60
	No	50	50	40
13- Do you spend more than one hour each day on the internet?	Yes	52.8	47.2	72
	No	42.9	57.1	28
14- Are you aware that foreign universities do have environmental policies?	Yes	55.6	44.4	72
	No	35.7	64.3	28
15- Do you think BZU should have one?	Yes	45.7	54.3	92
	No	100	0	8
16- Are you with the saying “preserving the land is more difficult than having a land”	Yes	48.9	51.1	90
	No	60	40	10

Table 8 Results of Student's questionnaire

Questions	Y/N	Total		Students
Environment at BZU		Female%	Male%	**%**
1- Do you have any information about environmental conditions at BZU?	Yes	27.3	34.7	30.8
	No	72.7	65.3	69.2
2- Do you know how and where solid wastes are disposed off at BZU?(solid wastes: rubbish, plastics, glass, paper, construction & food …)	Yes	17.4	18.6	18
	No	82.6	81.4	82
3- Are you aware that BZU do have a wastewater treatment plant at campus?	Yes	56.8	60.2	58.4
	No	43.2	39.8	41.6
4- If so, do you think the treated water can be used for agricultural irrigation of campus trees?	Yes	73.5	74.6	74
	No	18.9	19.5	19.2
	N/A	7.6	5.9	6.8
5- In your opinion, does the university need more greening areas or trees?	Yes	85.6	89	87.2
	No	14.4	11	12.8
6- Are you a smoker?	Yes	9.1	28.8	18.4
	No	90.9	71.2	81.6
7- If there is a rule to prohibit smoking under a roof at BZU, will you agree?	Yes	80.3	72.9	76.8
	No	19.7	27.1	23.2
8- Are you satisfied with the condition system (Heating and cooling) at the university?	Yes	33.3	44.1	38.4
	No	66.7	55.9	61.6
9- Do you think that the speakerphones used in certain activities make a noise?	Yes	60.6	62.7	61.6
	No	39.4	37.3	38.4
10- Do you think that parking areas (for cars) should be outside the campus?	Yes	69.7	61.9	66
	No	30.3	38.1	34
11- Have you any idea about solid waste recycling?	Yes	43.9	37.3	40.8
	No	56.1	62.7	59.2
12- If yes, will you use recyclable materials?	Yes	41.7	44.4	43
	No	36.4	35	35.7
	N/A	22	20.5	21.3
13- Would you accept the separation system of materials at source (papers, plastics, glasses, food…) in the central cafeteria and the campus?	Yes	83.3	77.1	80.4
	No	16.7	22.9	19.6
14- Is there a need for an environmental office at BZU?	Yes	89.4	86.4	88
	No	10.6	13.6	12
15- Do you feel a need for more environmental info illustrating actual status at BZU?	Yes	84.1	81.4	82.8
	No	15.9	18.6	17.2
16- If compulsory course named "Environmental Science and Engineering" is offered, would you register for this course?	Yes	59.1	55.1	57.2
	No	40.9	44.9	42.8

Questions	Y/N	Total		Students
Environmental Management System		Female%	Male%	
1- Have you heard about EMS?	Yes	11.4	17.8	14.4
	No	88.6	82.2	85.6
2- Do you know what the ISO 14001 is?	Yes	21.2	9.3	15.6
	No	78.8	90.7	84.4
3- In your opinion, does BZU need an environmental policy?	Yes	92.4	91.5	92
	No	7.6	8.5	8
4- Does BZU need adequate internal communications about EMS?	Yes	84.1	85.6	84.8
	No	15.9	14.4	15.2
5- Do you think that there is a few information about environmental knowledge?	Yes	80.3	78	79.2
	No	19.7	22	20.8
6- Are you ready to attend a workshop about implementing EMS at BZU?	Yes	64.1	56.8	60.6
	No	35.9	43.2	39.4
7- Do you think that there is a relationship between environment and economy?	Yes	86.4	86.4	86.4
	No	13.6	13.6	13.6
8- In your opinion, is it more beneficial to have a university requirement concerning environment instead of other courses?	Yes	74.2	69.5	72
	No	25.8	30.5	28
9- If there are environmental rules at BZU, are you ready to commit your self to?	Yes	85.5	82.2	83.9
	No	14.5	17.8	16.1
10- Are you ready to change some habits in order to adapt with any environmental rules?	Yes	87.1	87.3	87.2
	No	12.9	12.7	12.8
11- Are you with taking serious actions with any person who violates environmental rules?	Yes	81.1	70.3	76
	No	18.9	29.7	24
12- If it is needed to cut a certain percentage (0.5-1%) of your salary or registration fees for EMS system at BZU, will you accept?	Yes	56.8	50	53.6
	No	43.2	50	46.4
13- Do you spend more than one hour each day on the internet?	Yes	47	62.4	54.2
	No	53	37.6	45.8
14- Are you aware that foreign universities do have environmental policies?	Yes	72	68.6	70.4
	No	28	31.4	29.6
15- Do you think BZU should have one?	Yes	93.2	91.5	92.4
	No	6.8	8.5	7.6
16- Are you with the saying “preserving the land is more difficult than having a land”	Yes	87.9	87.3	87.6
	No	12.1	12.7	12.4

Questions	Female (%)							Male (%)						
	Y/N	E	S	C	A	L	G.S	E	S	C	A	L	G.S
1a	Yes	22	50	27	31	11	15	33	20	25	33	52	38
	No	78	50	73	69	89	85	68	80	75	67	48	62
2a	Yes	33	27	17	22	0	10	13	15	25	17	26	24
	No	67	73	83	78	100	90	88	85	75	83	74	76
3a	Yes	44	64	50	59	53	65	53	80	38	83	57	62
	No	56	36	50	41	47	35	48	20	63	17	43	38
4a	Yes	67	82	70	59	84	85	65	85	88	83	74	76
	No	11	5	27	38	5	10	23	10	13	17	26	19
	N/A	22	14	3	3	11	5	13	5	0	0	0	5
5a	Yes	89	91	83	81	89	85	85	100	63	100	83	100
	No	11	9	17	19	11	15	15	0	38	0	17	0
6a	Yes	0	0	13	6	16	15	28	35	25	0	26	38
	No	100	100	87	94	84	85	73	65	75	100	74	62
7a	Yes	100	82	83	69	68	95	78	65	75	83	74	67
	No	0	18	17	31	32	5	23	35	25	17	26	33
8a	Yes	56	36	33	28	21	40	35	40	50	17	57	57
	No	44	64	67	72	79	60	65	60	50	83	43	43
9a	Yes	56	55	63	47	79	70	60	70	63	67	65	57
	No	44	45	37	53	21	30	40	30	38	33	35	43
10a	Yes	67	73	63	72	74	70	65	65	63	100	35	71
	No	33	27	37	28	26	30	35	35	38	0	65	29
11a	Yes	56	41	33	31	42	80	28	40	50	33	35	52
	No	44	59	67	69	58	20	73	60	50	67	65	48
12a	Yes	44	41	33	28	47	70	50	30	63	33	39	50
	No	22	27	40	56	26	25	28	35	25	50	57	25
	N/A	33	32	27	16	26	5	23	35	13	17	4	25

13a	Yes	78	91	83	75	74	100	80	70	63	67	83	81
	No	22	9	17	25	26	0	20	30	38	33	17	19
14a	Yes	89	86	93	81	95	95	88	90	88	100	78	86
	No	11	14	7	19	5	5	13	10	13	0	22	14
15a	Yes	56	100	90	63	95	95	73	80	100	83	83	90
	No	44	0	10	38	5	5	28	20	0	17	17	10
16a	Yes	44	68	57	56	37	85	48	45	50	67	74	57
	No	56	32	43	44	63	15	53	55	50	33	26	43
1b	Yes	33	5	13	19		5	20	5	13	0	30	19
	No	67	95	87	81	100	95	80	95	88	100	70	81
2b	Yes	22	18	17	22	26	25	5	15	0	0	9	19
	No	78	82	83	78	74	75	95	85	100	100	91	81

3b	Yes	78	100	100	75	100	100	90	80	100	100	96	95
	No	22	0	0	25	0	0	10	20	0	0	4	5
4b	Yes	56	86	83	78	95	95	80	85	88	100	91	86
	No	44	14	17	22	5	5	20	15	13	0	9	14
5b	Yes	67	73	80	84	74	95	78	75	63	50	74	100
	No	33	27	20	16	26	5	23	25	38	50	26	0
6b	Yes	64	64	60	45	79	95	45	50	38	83	74	67
	No	56	36	40	55	21	5	55	50	63	17	26	33
7b	Yes	78	95	87	78	79	100	88	75	88	83	87	95
	No	22	5	13	22	21	0	13	25	13	17	13	5
8b	Yes	89	77	67	56	95	85	60	65	75	50	74	90
	No	11	23	33	44	5	15	40	35	25	50	26	10
9b	Yes	89	100	90	72	79	90	73	90	88	100	87	81
	No	11	0	10	28	21	10	28	10	13	0	13	19
10b	Yes	89	100	93	66	84	100	85	90	88	100	83	90
	No	11	0	7	34	16	0	15	10	13	0	17	10
11b	Yes	67	91	80	75	89	80	65	60	75	67	87	71
	No	33	9	20	25	11	20	35	40	25	33	13	29

12b	Yes	56	68	33	47	74	80	35	40	50	67	61	71
	No	44	32	67	53	26	20	65	60	50	33	39	29
13b	Yes	56	36	37	34	47	90	72	70	25	50	48	71
	No	44	64	63	66	53	10	28	30	75	50	52	29
14b	Yes	22	77	80	53	95	85	65	75	75	50	70	71
	No	78	23	20	47	5	15	35	25	25	50	30	29
15b	Yes	89	100	100	78	100	95	90	85	100	83	96	95
	No	11	0	0	22	0	5	10	15	0	17	4	5
16b	Yes	78	100	87	78	95	90	95	85	88	100	70	90
	No	22	0	13	22	5	10	5	15	13	0	30	10