Introduction:

I will borrow John Crowley’s definition of science ethics: “Science ethics” refers to the principles according to which scientific activity should be conducted – by professional scientists and by those with responsibility for research policies and the communication of scientific knowledge to relevant audiences – and to the mechanisms by which conformity to such principles is promoted, fostered or ensured. The field is therefore a very broad one – considerably broader than what the phrase “science ethics” might entail in other contexts. In particular, it is not limited to action taken by UNESCO itself in pursuance of its established normative mandate, but also includes UNESCO’s role in promoting, supporting and facilitating action by Member States to implement internationally agreed principles as well as cooperation between UNESCO and bodies such as professional associations to embed such principles in scientific practice.

Furthermore, the established international principles are themselves broad and require development, expansion, refinement and perhaps even revision in light of emerging ethical challenges, whether deriving from issues that have recently acquired enhanced relevance to the international community (e.g. in the various areas covered by environmental ethics) or from scientific and technological advances that appear to undermine or destabilize existing ethical principles or mechanisms (e.g. nanoscience and the various forms of nanotechnology).

MORAL PHILOSOPHY AND ENVIRONMENTAL ETHICS
Ethics is a very ancient human preoccupation (older, perhaps, than philosophy itself). And yet, environmental ethics is very new. Ethics deals with such general concepts as obligation, justice, rights, duties, virtue, beneficence, etc. Moral
philosophy deals, in general, with the evaluation of personal acts, conduct, motivation and policy. Within the general field of philosophy is ethics and moral philosophy -- the philosophical study of values ("goods" and "bads") that are, to some degree at least, under the control of some responsible, rational and deliberative person or persons. Like economic systems, moral codes evolve out of competition and cooperation: the competition for scarce goods, services, satisfactions and the security of personal interests, and cooperation to gain and enhance mutual welfare and security. Thus moral philosophy describes and prescribes constraints and liberties (duties and rights) that regulate social life so that all may fairly contribute to the just maximization of benefits and satisfactions for each (Partridge, 1981; William, 1973).

"Moral responsibility" normally implies knowledge, capacity, choice, and value significance (if a person is morally responsible to do something, then he/she (a) knows of this requirement, (b) is capable of performing it, (c) can freely choose whether or not to do it, and (d) the performance thereof affects the welfare and/or liberty of other beings).

Still less is the public or the "establishment" familiar with radically different approaches to the issue of man's responsibility to nature and this seriously complicates the task.

The concept of a "person" is central to moral philosophy. While the list of criteria that identify "personhood" is in some dispute, most moral philosophers would include most, if not all, of the following characteristics in that list:
✓ Sentience or the ability to feel pain.
✓ Consciousness of external objects and events.
✓ Reasoning, the ability to solve problems.
✓ Self-motivated activity.
✓ The capacity to communicate through the use of a complete, syntactic system of significant symbols (i.e., a language).
✓ A concept of oneself as a being continuing through time.
✓ A capacity to conceptualize and choose among alternative futures.
✓ A capacity to act on principle -- to deliberately govern one's behavior according to rules.
✓ Recognition of the personhood of other persons.

The reason that this definition is crucial to moral philosophy is that only such a being as that described above can be said to be "morally responsible" or "duty-bound" (as, for example, infants and animals are not). Because the only "persons" known are human beings, there is a widespread temptation to treat the terms "person" and "human being" as synonymous. This careless equation of meaning leads to a great deal of confusion and befuddlement in moral arguments, most notably arguments over such issues as abortion, euthanasia, and environmental ethics.

The question of whether a being is or is not a person has fundamental bearing upon one’s moral conduct toward that being. Persons are afforded dignity, deserve respect, assume duties and responsibilities, and hold rights to a degree that non-persons do not. Thus, if dolphins were, in fact, persons, the attitudes toward them would change at once, and would (for example) require, by law, that fishermen be much more careful about the dolphins' "personal" safety.

The vocabulary and the rationale of moral philosophy have traditionally been applied to the community of human persons. Thus the attempt to extend ethical inquiry beyond human contexts to life communities (i.e., to ecosystems) introduces deep conceptual and methodological problems (Partridge, 1981; William, 1973).

Environmental ethics is concerned with the issue of responsible personal conduct with respect to natural landscapes, resources, species, and living/non-living organisms. (Strictly speaking, "environmental ethics" could be interpreted more broadly to include questions of responsibility toward artificial environments).
In view of the recent dramatic growth in knowledge and technology, it is not difficult to see why this is so. Ethics deals with the domain of imaginable human conduct that falls between the impossible and the inevitable -- that is, within the area of human capacity and choice. And today, even within human's lifetime, humans have acquired capabilities and thus face choices that have never been faced before in the course of human history. These include choices of birth, life, and death for humans and “others”; choices that are rapidly changing the living landscape forever (Partridge, 1981).

Today, with knowledge came power, and with both knowledge and power, humans have lost innocence. This knowledge and this power are due, of course, to the scientific revolution; and therein resides a puzzle and a paradox: The scientists, steadfastly and correctly, claim that their content and methodology are "value neutral." In the narrow sense, they are right. As methodology, science is properly value-free and should be value-free. But this "properly value-free" methodology has opened up a bewildering array of capacities and choices. However, scientists (and others) are not equipped with the ethical insights and the moral restraints that are necessary to deal wisely and appropriately with these choices. Yet the choices are there and cannot be evaded. "Not to decide is to decide."

The issues of environmental ethics are momentous, live and forced. The moral responsibility to nature and to the future is of unprecedented significance and urgency, and it is a responsibility that cannot be escaped. In humans careless and capricious hands lies the fate of the natural environment, other species (from earth and other planets), and the generations that will succeed. Dealing with the natural environment cases of human judgments can easily be cited:

- Loggers will tell that if they are allowed to cut the last of the forests homes will cost considerably less.
- Nuclear Power proponents will say that if they build plants, electricity bills will be reduced.
- The oil companies claim that oil spills, though regrettable, are unavoidable but acceptable costs for our civilized condition.
- Proponents of weapons of mass destruction (WMD) will argue the need for modern democracies.
- Etc

All will claim that if they have their way, fewer people will be out of work and that the gross national product will continue to grow. Suppose they are right! What is the answer to this "cost-benefit" approach to environmental policy-
making? Can one propose and defend a different approach to policy analysis? After all, environmental decisions must be made. If the present decision-making rules and methods are inadequate, what alternatives might be proposed?

Because one's response to these requirements reflects upon his/her value as a person, it is said that this response has "moral significance." This analysis of "moral responsibility" might help to explain why "environmental ethics" has only recently attracted the attention and concern of moral philosophers. Quite simply, until recently human’s effects upon the natural environment were regarded as morally neutral since nature, is assumed, as both impersonal and too vast to be injured by human interventions, or else, at the very least, humans were quite unable to foresee the harm resulting from their dealings with nature. Now, of course, people know better. It is known that humans can cause massive and permanent damage to natural landscapes, resources and ecosystems. Not only do people know that they can cause these insults, they also know how they can cause them, and how they can prevent or remedy them. Knowing all this exacts a moral obligation to act with care, foresight and, at times, with forbearance and constraint. In humans dealings with the natural environment, they are, in short, called upon to reflect, act, or perhaps to refrain from acting, in a manner which testifies to their worth as persons and as a culture -- in a word, to respond morally.

Environmental ethics, then, might include such issues as the following:

- Why care about nature "for itself" when only people "matter"? If you deny that "only people matter," on what grounds can you defend that denial? (After all, if no people are around to regret it, what difference does it make if a species, a canyon, or even a planet is destroyed? If people who are around prefer to destroy natural objects and landscapes, then so what? Why not?)
- When species or landscapes or wilderness areas are destroyed, what, of value, is lost to mankind?
- "Should Trees Have [Legal] Standing?" On what grounds, if not for mankind's sake?
- Does "land ownership" make moral sense, or is it a morally absurd and repugnant concept (in Western culture as the native Americans would claim).
- Do human beings have a need for nature that implies an obligation to preserve it? What is the evidence for this?
• What are the ultimate grounds of an affirmation to protect the environment? Are they rational? Irrational? Non-rational? Mystical?
• What, basically, is wrong with the developer's anthropocentric and utilitarian land ethic? Why not treat land as a "commodity" rather than a "community"?
• If water runners enjoyed water sports since when and thousands power boaters and water skiers enjoy it now, then why not have artificial Lakes?
• Will future generations "miss" what we have "taken from them"? (How could they if they never will know what they have "lost"?) Do future generations (who, after all, do not exist now) have a "right" now to a clean and natural environment when their time comes?
• Can man "improve" upon nature? How? What constitutes "improvement"?
• Do the facts of environmental science have moral implications?
• Are human beings psychologically capable of caring for nature and for future generations? If they have this capacity, are they morally obligated to nurture it? . . . and so forth . . .

One of the most serious problems with the environmental movement today is that its moral position is badly articulated and defended -- it is more "felt" than thought through. This paper, is intended to help shed light on (not to remedy) that defect.

"Environmental Ethics" is to be identified as a meta-ethical term designating any ethical position that expresses a viewpoint concerning man's responsibility to nature. "Ecological morality," on the other hand, identifies the particular normative environmental ethics of such philosophers, who view man as a part of the natural community with duties of respect and forbearance toward that community.

KEY DOCUMENTS:

The key international document that provides a focus in this area is the RECOMMENDATION ON THE STATUS OF SCIENTIFIC RESEARCHERS adopted by the UNESCO General Conference in 1974. The key ethical principles enshrined in the 1974 Recommendation, which converge on the responsibilities incumbent on researchers as a corollary of the status afforded to them, may be summarized as follows.

- Responsibility to ensure that science serves the interests of humanity as a whole: "the full potentialities of scientific and technological knowledge [should]
be promptly geared to the benefit of all peoples” (article 19, to be read in light of the reference in the preamble to the right “to share in scientific advancement and its benefits” enshrined in article 27(1) of the Universal Declaration of Human Rights).

- Responsibility of scientists to conduct themselves in accordance with high ethical standards: “effective scientific research calls for scientific researchers of integrity and maturity, combining high moral and intellectual qualities” (article 10).

- Responsibility to “respect public accountability”, which is to be construed as a corollary of enjoyment of “the degree of autonomy appropriate to their task and to the advancement of science and technology” (article 8).

- Generic requirement of humane, social and ecological responsibility in research conduct (article 14 as quoted above), “social” responsibility being interpreted in terms of service to one’s own country (article 9(c)) and of “community service” (article 11(b)).

- Specific responsibility to be “vigilant” with respect to the “probable and possible social and ecological consequences of scientific research and experimental development activities” (article 12(b)(IV)).

BUDAPEST DECLARATION ON SCIENCE AND THE USE OF SCIENTIFIC

1. Science for Knowledge; knowledge for progress
2. Science for Peace
3. Science for development
4. Science in society and science for society

COMEST and IBEST

TRIPOLI DECLARATION: (Goal 7: Ensure environmental sustainability)

The key areas of work proposed by the declaration are defined as follows:

- “Establish and promote common values and benchmarks, as well as to promote ethical principles and standards to guide scientific progress and technological development, especially in developing countries that do not enjoy equal benefits of scientific and technological advances.

- Examine scientific progress in light of ethical considerations rooted in the cultural, legal, philosophical and religious heritage of the communities involved.
• Seek to create a better understanding of the major ethical issues raised by science and technology and support analysis and discussion of those issues internationally, regionally and nationally.
• Support the implementation and refinement of existing normative instruments, and the application of practices and tools to facilitate the growth and use of science and technology respecting human dignity and human rights.
• Support the development of new instruments as may be deemed necessary by the governing bodies.
• Promote ethical reflections and decision-making, including through international cooperation and the sharing of experience.
• Promote the application of the instruments and guidelines and strengthen their impact.
• Provide a forum for an interdisciplinary, multicultural and pluralistic reflection on new and emerging global issues, bringing together the intellectual and scientific communities, policy-makers, public and private stakeholders and actors of civil society.
• Establishment and reinforcement of national bodies and mechanisms of COMEST bodies.
• Involvement of society at large by raising awareness, undertaking advocacy and stimulating an open democratic debate about the ethical implications of scientific and technological developments and the link between ethics and governance.
• Ethics education for young scientists, professionals and trainers.

The application of this strategic framework to science ethics is straightforward, and serves as a reminder of the necessary articulation of four levels of reflection that might serve to structure discussion in this forum:

1. Analysis of challenges,
2. Elaboration of principles,
3. Development of mechanisms, and
4. Awareness-raising, education and training.

INSTRUMENTS: Mechanisms and tools to implement policies:

International Legal Instruments:
Declaration on Science and the Use of Scientific Knowledge (1999)
Universal Declaration on the Human Genome and Human Rights (1997)
International Declaration on Human Genetic Data (2003)
Universal Declaration on Bioethics and Human Rights (2005)
Expert meetings: Meetings involving general public, decision
Makers, the media 2009, Inter Regional Meeting on Ethics and Politics of
Nanotechnology

Local Instruments:
• specialized units in different sectors: The Higher Council for the
  Environment (committees: Biosafety, Biodiversity, Climate change,
  Desertification, Water, Energy, Pollution etc), Council for Strategic Planning,
  Ministries (Science and Tech, Higher Education, General Education, Energy,
  Tourism, Environment and Water Recourses etc).
• Universities and higher institutions: Institute of Environmental Studies
• Research centers: National Council for Research
• Scientific parks: African City (Park) for Science and Technology)
• NGOs (Sudanese Society of Environmental Protection)

SCIENTIFIC RESEARCH POLICIES IN SUDAN: CURRENT SITUATION
Scientific research policies are integrated in the Constitution and laws of Sudan. Article 13
shall guarantee academic freedom in institutions of higher education and shall protect
the freedom of scientific research within the ethical parameters of scientific research”.
Details of research policies are spelled out in the Law of Regulation of Higher Education
and Scientific Research (1995). One of the major objectives spelled out in the law is the
mobilization and encouragement of scientific research. Bylaws on Regulation of Scientific
Research and formation of specialized committees were drafted in 1998 by the Ministry of
Higher Education and Scientific Research. The Bylaws stressed development of appropriate
environment, opportunities, establishment of incentives and coordination between
government, academia and the private sector in conducting research.
The Sudan Quarter Century Strategy (2000-2025) emphasized development of scientific
research and highlighted areas of capacity building (both human and institutional
resources; development of a receptive society to scientific research (awareness rising)
coordination between the state, academia and the private sector and allocation of
adequate funding for basic and applied research.

ENVIRONMENTAL ISSUES:
Environmental issues constituted the greater part of the subjects and activities undertaken by researchers in Sudan. Issues of biodiversity and biosafety, especially technologies of GMOs, found good coverage in legislation and scientific research fora. A national biosafety framework was developed in 2004.

**National legislation and local policy:**

(1) **ENVIRONMENTAL ISSUES:**

Article 11 of the Interim Constitution of the Republic of Sudan, 2005 states that:

11. (1): The right of the people of the Sudan to a clean and diverse environment shall be guaranteed and safeguarded; and the State and the Citizens have the duty to preserve and promote the country’s biodiversity. The State shall not pursue any policy or take or permit any action, which may seriously affect the existence of any species or their natural or adopted habitat;

11. (2) The State shall promote, through legislation, sustainable utilization of natural resources and best practices with respect to management and control thereof;

(2) **ANIMAL BIOETHICS:**

Proper use of animals in research, though not regulated by laws, had some established guidelines in some institutions (Zoology Department, University of Khartoum, Faculty of Veterinary Science, University of Khartoum). A “draft Guidelines” is in use at the Zoology Department, U of K since 1970; a workshop on guidelines of use of animals in research was conducted at the Department of Zoology.

**ENVIRONMENTAL ISSUES:**

Nowadays, science and engineering face increasingly complex and encompassing ethical and social issues. Science and engineering practices are more and more interdisciplinary and operate in many organizational and societal contexts. Many professional associations are involved in developing codes of ethics, hosting conferences on ethical problems in research practice, or exploring relationships among science, engineering, and society.…Higher education institutions train citizens who will perform key roles in society as professionals who have decision-making responsibilities in public and private sectors of society.
Member of the academic community, teachers, scientific, researchers and students have a responsibility to comply with the ethical principles on: academic freedom, intellectual integrity, and the fair and respectful treatment of others etc. Introducing values education and professional ethics is important for raising scientists and students awareness about their responsibility and of the social value of their professional work. Nevertheless, the teaching of ethical issues occupies a marginal position in academic syllabi, (particularly at the university level).

**Environment and Urban Development:** Environmental Management; Coastal Management and Atmospheric Pollution; Urban Infrastructure Development; Advanced Systems

**Food Resources and Greenery:** Arid land Agriculture and Greenery; Aquaculture, Fisheries, and Marine Environment; Biotechnology

**Petroleum Research and Research Centers:** Petroleum Production; Petrochemical Processes; Petroleum Refining;

**Techno Economics:** Economic Studies; Quantitative Methods and Modeling

**Water Resources:** Hydrology; Water Management; Desalination; Wastewater

**Local Issues as reflected on the Consultative meeting (2007)**

- دمج أخلاقيات البيئة في السياسات الوطنية (نحو أخلاقيات و تنمية بيئة مستدامة)
- مقاصد الشرعية
- النشاط الاقتصادي: البيئة و الفقر
- مناهج تعليم البيئة
- أخلاقيات التعامل مع البيئة البحرية
- التلوث: ملوثات الهواء، الأمدة، والرياح، والرصاص، و التلوث المياه
- الجفاف و التصحح: الرعي، الجائر القطيع، الجائر تجريف الأرض للزراعة
- تعرية/تحرير التربة: صناعة الطوب
- الضوابط و التشريعات
- لجنة الأمان الحيوي
- الإعلام البيئي

**ETHICAL FRAMEWORK:**

Laws regulating: Intellectual property Rights, Bioethics and Biosafety bodies, (Regional expert meeting on incorporation of ethics of the environment into national legislations. Khartoum, Sudan 9/2007); (WMD) weapons of mass destruction, Laws protecting medicinal plants and herbs, GMOs, Wildlife, Release of pathogens-microorganisms etc.
Recommendations:

Increase moral sensitivity, sensibility and awareness.

build and reinforce linkages among ethicists, scientists, policy-makers and civil society to assist in enacting sound and reasoned policies on environmental ethical issues: “True dialogue, based upon respect for commonly shared values and the dignity of each civilization and culture”; Standard-setting, Awareness raising: all stakeholders should be informed of what issues exist and why (- Scientific community - Policy makers - General public (the youth))

Standard-setting: Internationally applicable code of conduct for scientists.

Capacity building: Education, network building, resource provision and technical advice.

1- The Ethics Education Programme
2- The Global Ethics Observatory
3- Ethics around the World Programme.

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