**ESS Vocabulary**

Topic 1

1. **Equilibrium** A state of balance among the components of a system.
2. **Feedback** The return of part of the output from a system as input, so as to affect

succeeding outputs.

1. **Feedback, negative** Feedback that tends to damp down, neutralize or counteract any

deviation from an equilibrium, and promotes stability.

1. **Feedback, positive** Feedback that amplifies or increases change; it leads to exponential

deviation away from an equilibrium.

1. **Gaia** The Gaia hypothesis (developed by James Lovelock and named after an

ancient Greek Earth goddess) compares the Earth to a living organism in

which feedback mechanisms maintain equilibrium.

1. **Model** A simplified description designed to show the structure or workings of an

object, system or concept.

1. **System** An assemblage of parts and the relationships between them, which

together constitute an entity or whole.

1. **System, closed** A system in which energy, but not matter, is exchanged with its surroundings.
2. **System, isolated** A system that exchanges neither matter nor energy with it s

surroundings.

1. **System, open** A system in which both matter and energy are exchanged with its

surroundings (for example, natural ecosystems).

1. **Stable equilibrium** The condition of a system in which there is a tendency for it to return to a previous equilibrium condition following disturbance.
2. **Steady‑state equilibrium** The condition of an open system in which there are no changes over the longer term, but in which there may be oscillations in the very short term. There are continuing inputs and outputs of matter and energy, but the

system as a whole remains in a more or less constant state (for example, a

climax ecosystem).

Topic 2

1. **Correlation** A measure of the association between two variables. If two variables tend

to move up or down together, they are said to be positively correlated. If they tend to move in opposite directions, they are said to be negatively correlated.

1. **Abiotic factor** A non‑living, physical factor that may influence an organism or ecosystem;for example, temperature, sunlight, pH, salinity, precipitation.
2. **Biochemical oxygen demand (BOD)** A measure of the amount of dissolved oxygen required to break down theorganic material in a given volume of water through aerobic biological activity.
3. **Biomass** The mass of organic material in organisms or ecosystems, usually per unit

area. Sometimes the term “dry weight biomass” is used where mass is measured after the removal of water. Water is not organic material and inorganic material is usually relatively insignificant in terms of mass.

1. **Biome** A collection of ecosystems sharing similar climatic conditions; for

example, tundra, tropical rainforest, desert.

1. **Biosphere** That part of the Earth inhabited by organisms, that is, the narrow zone (a

few kilometres in thickness) in which plants and animals exist. It extends

from the upper part of the atmosphere (where birds, insects and windblown

pollen may be found) down to the deepest part of the Earth’s crust to which living organisms venture.

1. **Biotic factor** A living, biological factor that may influence an organism or ecosystem;

for example, predation, parasitism, disease, competition.

1. **Carrying capacity** The maximum number of a species or “load” that can be sustainably

supported by a given environment.

1. **Climax community** A community of organisms that is more or less stable, and that is in

equilibrium with natural environmental conditions such as climate; the

end point of ecological succession.

1. **Community** A group of populations living and interacting with each other in a

common habitat.

1. **Competition** A common demand by two or more organisms upon a limited supply of a resource; for example, food, water, light, space, mates, nesting sites. It may be intraspecific or interspecific.
2. **Habitat** The environment in which a species normally lives.
3. **Ecosystem** A community of interdependent organisms and the physical environment

they inhabit.

1. **Entropy** A measure of the amount of disorder, chaos or randomness in a system;

the greater the disorder, the higher the level of entropy.

1. ***K*-strategist** Species that usually concentrate their reproductive investment in a small

number of offspring, thus increasing their survival rate and adapting

them for living in long‑term climax communities.

1. **Mutualism** A relationship between individuals of two or more species in which all

benefit and none suffer. (The term symbiosis will not be used.)

1. **Niche** A species’ share of a habitat and the resources in it. An organism’s ecological

niche depends not only on where it lives but also on what it does.

1. **Parasitism** A relationship between two species in which one species (the parasite)

lives in or on another (the host), gaining all or much (in the case of a

partial parasite) of its food from it.

1. **Population** A group of organisms of the same species living in the same area at the

same time, and which are capable of interbreeding.

1. **Productivity, gross (GP)** The total gain in energy or biomass per unit area per unit time, which could be through photosynthesis in primary producers or absorption in consumers.
2. **Productivity, gross primary (GPP)** The total gain in energy or biomass per unit area per unit time fixed by photosynthesis in green plants.
3. **Productivity, gross secondary (GSP)**The total gain by consumers in energy or biomass per unit area per unit time through absorption.
4. **Productivity, net (NP)** The gain in energy or biomass per unit area per unit time remaining after allowing for respiratory losses (R). Other metabolic losses may take place,

but these may be ignored when calculating and defining net productivity

for the purpose of this course.

1. **Productivity, net primary (NPP)** The gain by producers in energy or biomass per unit area per unit time remaining after allowing for respiratory losses (R). This is potentially

available to consumers in an ecosystem.

1. **Productivity, net secondary (NSP)** The gain by consumers in energy or biomass per unit area per unit time remaining after allowing for respiratory losses (R).
2. **Productivity, primary** The gain by producers in energy or biomass per unit area per unit time. This term could refer to either gross or net primary productivity.
3. **Productivity, secondary** The biomass gained by heterotrophic organisms, through feeding and absorption, measured in units of mass or energy per unit area per unit

time.

1. ***r*-strategist** Species that tend to spread their reproductive investment among a

large number of offspring so that they are well adapted to colonize new

habitats rapidly and make opportunistic use of short-lived resources.

1. **Sere** The set of communities that succeed one another over the course of

succession at a given location.

1. **Species** A group of organisms that interbreed and produce fertile offspring.
2. **Succession** The orderly process of change over time in a community. Changes in

the community of organisms frequently cause changes in the physical environment that allow another community to become established and replace the former through competition. Often, but not inevitably, the later communities in such a sequence or sere are more complex than those that appear earlier.

1. **Trophic level** The position that an organism occupies in a food chain, or a group of

organisms in a community that occupy the same position in food chains.

1. **Zonation** The arrangement or patterning of plant communities or ecosystems into

parallel or sub‑parallel bands in response to change, over a distance, in some environmental factor. The main biomes display zonation in relation to latitude and climate. Plant communities may also display zonation with altitude on a mountain, or around the edge of a pond in relation to soil moisture.

Topic 3

1. **Ecological footprint** The area of land and water required to support a defined human

population at a given standard of living. The measure takes account of the area required to provide all the resources needed by the population, and the assimilation of all wastes. (A method of calculation is provided in 3.8.2.)

3.1

1. **Crude birth rate** The number of births per thousand individuals in a population per year.
2. **Crude death rate** The number of deaths per thousand individuals in a population per year.
3. **Demographic transition** A general model describing the changing levels of fertility and mortality in a human population over time. It was developed with reference to

the transition experienced as developed countries (for example, those of North America, Europe, Australasia) passed through the processes of industrialization and urbanization.

1. **Doubling time** The number of years it would take a population to double its size at its

current growth rate. A natural increase rate of 1% will enable a human population to double in 70 years. Other doubling times can then be calculated proportionately, that is, the doubling time for any human population is equal to 70 divided by the natural increase rate.

1. **Fertility** In the context of human populations, this refers to the potential for

reproduction exhibited in a population. It may be measured as fertility

rate, which is the number of births per thousand women of child‑bearing

age. Alternatively it may be measured as total fertility, which is simply the

average number of children a woman has in her lifetime.

1. **LEDC** Less economically developed country: a country with low to moderate

industrialization and low to moderate average GNP *per capita*.

1. **MEDC** More economically developed country: a highly industrialized country

with high average GNP *per capita*.

1. **Natural capital** A term sometimes used by economists for natural resources that, if

appropriately managed, can produce a “natural income” of goods and

services. The natural capital of a forest might provide a continuing natural

income of timber, game, water and recreation.

1. **Natural increase, rate of** The form in which human population growth rates are usually expressed: Inward and outward migration is ignored.

**3.2**

1. **Sustainability** Use of global resources at a rate that allows natural regeneration and

minimizes damage to the environment. For example, a system of

harvesting renewable resources at a rate that will be replaced by natural

growth might be considered to demonstrate sustainability.

1. **Natural capital, non-renewable** Natural resources that cannot be replenished within a timescale of thesame order as that at which they are taken from the environment and

used; for example, fossil fuels.

1. **Natural capital, renewable** Natural resources that have a sustainable yield or harvest equal to or less than their natural productivity; for example, food crops, timber.
2. **Natural capital, replenishable** Non‑living natural resources that depend on the energy of the Sun for their replenishment; for example, groundwater.

3.4

1. **Soil** A mixture of mineral particles and organic material that covers the land,

and in which terrestrial plants grow.

1. **Soil profile** A vertical section through a soil, from the surface down to the parent material, revealing the soil layers or horizons.
2. **GNP** Gross National Product, the current value of all goods and services

produced in a country per year.

Topic 4

1. **Biodiversity** The amount of biological or living diversity per unit area. It includes the

concepts of species diversity, habitat diversity and genetic diversity.

1. **Diversity** A generic term for heterogeneity. The scientific meaning of diversity

becomes clear from the context in which it is used; it may refer to heterogeneity of species or habitat, or to genetic heterogeneity.

1. **Genetic diversity** The range of genetic material present in a gene pool or population of a

species.

1. **Habitat diversity,** The range of different habitats or number of ecological niches per unit

area in an ecosystem, community or biome. Conservation of habitat diversity usually leads to the conservation of species and geneticdiversity.

1. **Diversity index** A numerical measure of species diversity that is derived from both the

number of species (variety) and their proportional abundance.

1. **Species Diversity** The variety of species per unit area. This includes both the number of

species present and their relative abundance.

1. **Evolution** The cumulative, gradual change in the genetic characteristics of successive

generations of a species or race of an organism, ultimately giving rise to species or races different from the common ancestor. Evolution reflects changes in the genetic composition of a population over time.

1. **Isolation** The process by which two populations become separated by

geographical, behavioral, genetic or reproductive factors. If gene flow

between the two subpopulations is prevented, new species may evolve.

See **evolution**.

1. **Plate tectonics** The movement of the eight major and several minor internally rigid plates of the Earth’s lithosphere in relation to each other and to the partially

mobile asthenosphere below.

1. **Speciation** The process through which new species form. See also **evolution**.

Topic 5

1. **Environmental impact assessment (EIA)** A method of detailed survey required, in many countries, before amajor development. Ideally it should be independent of, but paid for by, the developer. Such a survey should include a baseline study to

measure environmental conditions before development commences,

and to identify areas and species of conservation importance. The report

produced is known as an environmental impact statement (EIS) or

environmental management review in some countries. The monitoring

should continue for some time after the development.

1. **Biodegradable** Capable of being broken down by natural biological processes; for

example, the activities of decomposer organisms.

1. **Eutrophication** The natural or artificial enrichment of a body of water, particularly with

respect to nitrates and phosphates, that results in depletion of the oxygen

content of the water. Eutrophication is accelerated by human activities that add detergents, sewage or agricultural fertilizers to bodies of water.

1. **Halogenated organic gases** Usually known as halocarbons and first identified as depleting the ozone layer in the stratosphere. Now known to be potent greenhouse gases.

The most well known are chlorofluorocarbons (CFCs).

1. **Pollution** The addition to an environment of a substance or an agent (such as heat)

by human activity, at a rate greater than that at which it can be rendered

harmless by the environment, and which has an appreciable effect on the

organisms within it.

1. **Pollution, non-point source** The release of pollutants from numerous, widely dispersed origins; for example, gases from the exhaust systems of vehicles.
2. **Pollution, point source** The release of pollutants from a single, clearly identifiable site; for example, a factory chimney or the waste disposal pipe of a factory into a river.
3. **Smog** The term now used for any haziness in the atmosphere caused by

air pollutants. Photochemical smog is produced through the effect of

ultraviolet light on the products of internal combustion engines. It may

contain ozone and is damaging to the human respiratory system and

eyes.

Topic 6

1. **Global warming** An increase in average temperature of the Earth’s atmosphere.
2. **Greenhouse gases** Those atmospheric gases which absorb infrared radiation, causing world temperatures to be warmer than they would otherwise be. This process is sometimes known as “radiation trapping”. The natural greenhouse effect is caused mainly by water and carbon dioxide. Human activities have led to an increase in the levels of carbon dioxide, methane and nitrous oxide (dinitrogen oxide, N2O) in the atmosphere, and there are fears that this

may lead to **global warming**.

Topic 7

1. **Society** An arbitrary group of individuals who share some common characteristic

such as geographical location, cultural background, historical timeframe,

religious perspective, value system, and so on.