LAND USE CHANGES: THE INITIATOR OF ENVIRONMENTAL PROBLEM[1]

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ABSTRACT

The aim of this paper is to point out the influence of land use changes on environmental tragedies, and also to show how sudden shift in land use pattern due to economic development can contribute towards environmental degradation. Changes in land usage and land use pattern, mostly considered the most affecting factor involving environmental disaster tragedies. The current threat to the environment, which is a common concern of all mankind, stems essentially from past neglect in managing the natural environment and resources. In the developed world, especially in Europe, agriculture has caused the removal of a significant proportion of the natural vegetation. The most, significant impacts of agriculture in the developing world are deforestation, desertification, salnisation and soil erosion. In just a few decades, major parts of Asia have transformed from essentially traditional agricultural societies to intensive export oriented industrial economics, plunging the region into severe ecological and social disruption. Environmental change is a continual process that has been in operation since the earth first came into existence some 5,000,000,000 years ago. The change occurred drastically when man made powerful change through his capacity to develop technology. This can occur directly through activities such as habitat loss and urban expansion. Malaysia, which experiences a unique situation where the significant economic development was achieved without sacrificing most of the natural environment. However, the recent shift in the economic sector has created a new fear, the present balance between economic development and natural environment can not be sustained

KEY WORDS: ***Environmental Policy, Environmental Management, Land use Changes***

1.1 INTRODUCTION

One of the most pressing issues of global change research focuses on the human management of natural land cover or its conversion for human use. While much anthropogenic land use takes place at the scale of small individual units of production, its impact is global and cumulative. It is also clear that in the 20th century anthropogenic land use has accelerated, with complex and important implications for micro- and landscape-scale environmental degradation (Blaikie and Brookfield 1987; Turner 1991) and for more global processes of environmental change (Turner et al. 1993).

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As Turner has argued, there are two kinds of global change important to the consideration of human land use: "systemic" global environmental changes (biogeochemical and hydrological cycles, for example), and "cumulative" global changes (changes in soil composition or biodiversity) (Turner 1990). To this we add the argument that human land use is interesting in its own right because it provides the interactive medium by which human societies and biophysical dynamics of the biosphere co-mingle. Land use, in all its complexity, also feeds back into multi-scale social driving forces such as population, agricultural development, built environment, and so on.

One of the new and controversial findings of the 1970s has become one of the commonplaces of current landscape scale ecology; that local ecological change must be thought of in terms of more general environmental impact (Holling 1986). This observation seems particularly valid for **land use** and **land cover change**, as they are demonstrably local phenomena with global impacts. Land use change is typically thought of as having global impact in the cumulative sense with respect to biodiversity, soil degradation, and desertification. In addition, it has a direct global impact with respect to open biogeochemical cycles (those that include an atmospheric component, including the hydrologic cycle) and albedo effects. In recent years, the human management strategies for land cover and use have also taken on such a multi-scale aspect, or at least aspire to.

This paper is intended as an initial framework discussion for a comparative analysis of human dimensions of land cover and use change. It is designed explicitly to serve several somewhat distinct objectives:

- to establish a linkage between biophysical and human aspects of land cover and use;
- to suggest a framework for an eventual global typology of land use situations and dynamics;
- to link the analysis of human dimensions to global land classification and land cover modeling efforts; and
- To provide a first step in determining what regions of the world might be given priority in future empirical research on global land cover and use change.
- to establish the impacts and causes of impacts of land use changes

It is also clear that the study of the human dimensions of land use and cover change offers the opportunity to study the interaction of human management and natural ecosystem performance over different time scales, which is one of the most interesting and pressing themes of our time.

1.2 PAST, CURRENT, FUTURE LAND USE AND LAND USE MANAGEMENT

What is the value of history to ecology? More specifically, what can historical, time-series date tell us that is relevant to current land management? Land use is a function of culture and settlements pattern as well as environmental characteristics (Meinig 1968;

Rappaport 1968; Bennett 1976; Robbins et al. 1983). The interactions of social, economic and ecological factors are described in a large, diverse literature. Measures of social and economic conditions that have been shown to influence or be correlated to land-use patterns include historical land use (Tunner and Meyer 1991; Svisky 1993). Land use changes can be linked and must be linked to environmental tragedies. Many do not understand the simple concept of land use changes that can result in environmental disasters. Land use changes can be defined according to the aspects of law, economy, sociology and geography.

In this paper, the environmental tragedies will be studied according geography terminology. According to Sanderson & Prithchard (1993) land, use changes can be defined as change of original land cover to a new landscape. Even a small change to the land cover can categorize as land use changes. Land use changes occur due to many factors, but, the most influencing factor must be human intervention, such as agriculture, urbanization, building of infrastructure (roads, dams) and recreational activities.

Over one-third of the land, area of the world is in cropland or pasture, and a third is still covered in forests and woodlands. The two dominant land use activities are forestry and agriculture. While increasing amounts of land have been and will continue to be lost to cities, infrastructure and various forms of permanent degradation brought about through desertification, erosion, salinity, toxic waste and mining, it is successful agriculture and forestry that will ultimately decide whether life on earth can be sustained.

Recognizing the importance of studies in land-use (such as logging, ranching, agriculture, wildlife preserve, urban settlements) and land-cover (such as forests, grassland, cropland, wetland, non-biotic construction) change for understanding global environmental change, the international Geosphere Biosphere Programme (IGBP) and the international Human Dimensions Programs on Global Environmental Change (IHDP) formed an ad-hoc working Group in 1991.

Every city or region must make decisions about how to use land and where to place houses, schools, libraries, airports, hospitals, prisons, power plants, roads and airports. Often there is a great deal of controversy over land use decisions. For example: -

-Residents does not want factories, prisons or airports near their homes.
-Developer argues for zoning laws permitting them to build multi-unit housing on agricultural lands.
-The utility company and homeowners debate the safety of building a nuclear power plant on a known earthquake fault.
-Commuters and landowners often disagree on plans for widening or building new highways or rapid transit systems.

Land uses changes mainly controlled by an important factor, which is fast population growth, especially in the developed world. In just over 50 years, the world's population will have increased from just over 5 billion to 10 billion; twice as many mouths to feed,

twice as many families needing energy, clean water, fibers, paper, vegetables oils, timber, and shelter. In the last 50 years, the World's population has doubled from about 2.5 billion. History shows that our ingenuity and strong instincts for survival will drive us to meet our immediate needs; we have been remarkably successful, even if this has been achieved at costs to the environment. Populations have more or less stabilized in the industrialized countries, but continue to grow in the emerging and developing nations.

The World's population is urbanizing faster than it is growing. The majority of people in industrialized countries and Latin America already live in an urban environment, so it is in Asia and Africa where urbanization will increase most rapidly. People who live in urban areas have different, often more demanding, patterns of consumption of food, building materials, water and energy; they have higher expectations for a better quality of life.

In April this year, the UNCSD agreed to establish an Inter-Governmental Panel on Forests to promote international consensus, cooperation and action on forest management. In his concluding remarks, the Chairman of CSD underlined:-

> "*An integrated approach to the planning and management of land resources was presented as a cornerstone in combating deforestation, desertification and drought; promoting sustainable agriculture, rural and mountain development; the conservation of biological diversity and the sustainable management of all types of forests*".

Sustainable patterns of production and consumption are popular concepts that are universally accepted as and the ideal towards which we should move. They are not a Utopian plateau upon which, once achieved, we can rest. Population growth, natural and man-made disasters, fluctuations in weather patterns and commodity prices, and rising expectations will require constant vigilance, maintenance and adaptation. Old technologies and some of the new ones will prove deficient in some way, as the sensitivity of our monitoring techniques improve our tolerance to imperfection decreases and our demands increase.

Many aspects of sustainability are measurable and monitorable – such as land use, biodiversity, vegetation, land productivity and pollution levels – but others are about opinion, democracy and choice. Social and economic, institutional and financial criteria will increasingly dominate decision-making on sustainability. Acceptable indicators or standards can be negotiated amongst stakeholders. The decisions made by societies on what we should sustain, where, how, for whom and for how long will have an increasing influence on land use practices. In the United Kingdom, the decisions in land use and the ownership of forests are increasingly influenced by public, often urban, opinion. It is the role of science and technology to help meet human needs, and realize their aspirations and goals – sustainable.

1.3 CAUSES OF LAND USE CHANGES

Deforestation and agriculture activity is the two main contributors towards land use changes. Historically, forests have usually lost ground to more intensive and quicker-yield forms of land use. Some destruction of forests has been accidentals as a result of disaster and fire; some has been caused by distorting policies that have encouraged people to over-exploit or destroy forest; and some from needs for timber and fuel, but the over-riding cause of deforestation has been the need for agriculture land to produce food, oils, beverages, fibers, latex's and other biological products. But simply understanding the causes of contemporary deforestation will not necessarily provide us with the solutions we seek.

There are many criteria used for assessing sustainability-ecological, economic, social and institutional. It is possible to identify some essential elements without which the prospects for sustainable land use are poor;

- A thorough knowledge of the nature, extent, state and best management practice for the land resources; and the means to detect and monitor the impact of change;
- A range of tested technologies and options for land use that will meet human needs and aspirations;
- Effective means to monitor the impact of development activities on the key elements of sustainability;
- The involvement and support of local communities and other stakeholders and potential beneficiaries;

If current land use cannot satisfy the needs and expectations of communities, it stands little prospect of being sustainable. A dynamic state of land use can be described as sustainable, provided it does not destroy or permanently degrade the basis of its productivity.

We are hampered by a lack of absolute performance measures for forestry. For forests, the objectives are less clear. The multiple functions and values of forests are seldom realized by an individual or single community. The stakeholders who value forests as sequestrates of carbon, modifiers of climate and weather patterns or resources of plants with potential pharmaceutical use are different to those who need firewood, fiber, food and timber, i.e. the values they give them are frequently different. These constituencies want different types of forests and forest products to those who simply want clean water and recreational facilities.

Forests and agriculture are integral parts of a land use 'continuum'. The original balance and distribution were determined by climate and geology; it is now decided by people, individually and collectively, responding to external; factors, ownership and their own wishes to develop and improve the quality of their lives. It is a complex model and one that varies between countries, regions and communities.

Decisions and policy makers should try to understand, quantify and optimize these

interactions. Many of these interactions are physical; others relate to social and institutional relationships. We know that forests have a major impact on the hydrology and hence land use of areas beyond the forest; the flow, silt load and seasonal reliability of surface water, springs and depth of ground water cannot only have a major impact on the time to rectify this mistakes, but can influence the incidence of water-related disasters and tragedies.

Most evidence comes from policy or market failure, where policies designed to benefit or regulate one aspect of economy impact badly on forestry. The boom in cassava production in Thailand as a result of preferential prices in Europe for cassava starch in the 1970s and early 1980s, resulted in a good deal of forest invasion and degradation. The clearing of land for cultivation greatly increased soil erosion on the sloping sandy soils of north and eastern Thailand.

Consideration of land cover and land use change has been dominated by a number of stereotypes, from the "hamburger steer" model of deforestation to the population-driven slash-and-burn of primary forest, to the trade-connected destruction of natural vegetation for forest products extraction. In turn, these stereotypes have operated within at least three meta-stereotypes, **humanist**, **ecological determinist**, and **co-evolutionist**, each of which embodies significantly different approaches to the system dynamics of land cover change.

Humans act on a passive nature. Much of the large literature on land tenure, agrarian structures, and rural development operates from a human centered perspective, without regard to ecological determinants, or operating under the apparent conviction that human technological drivers can generally overcome natural obstacles to settlement. Within this optic, political and social structures constitute the principal constraints on development, which are tempered by a durable techno-optimism (Blaikie and Brookfield, 1987). The environmental constraints on human activity may be acknowledged, but the origin or variability of those constraints is seldom questioned. Typically, this results in increased brittleness in managed landscapes, with management schemes tending to be ratcheted upward in the service of social and economic goals.

Classifications of land use typically focus on the human objective or product (agriculture, timber, and settlement). Land cover change occurs both as direct result of human activity (deforestation), or as a result of human activity mediated through the biophysical realm (groundwater withdrawal leading to a lowered water table leading to reduced stream flow and altered vegetation), or through a complex feedback of human activity on the biophysical world, impinging again on human activity, which then directly alters land cover (human introduction of rinderpest, change in wild herbivore population, advance of woodland with tsetse, leading ultimately to mechanized clearing; Sinclair 1979).

Natural dynamic cycles of disturbance both influence human use and determine the ways in which human disturbance will affect the system. For many societies, the rhythms of life set almost entirely by natural phenomena on time scales corresponding to diurnal, lunar and solar cycles.

1.4 IMPACTS OF LAND USE CHANGES

Positive comments, weather it is gradual or catastrophic, are necessary for environmental change to occur. Sine all environmental components are part of comment loops, each may be involved in exerting stress and may be recipients of the resulting strain. Either individually or in a group, the role of environmental components in initiating stress and ultimate change will vary in magnitude both spatially and temporally. The outcome will depend on the internal resilience of the given environmental system. The human impact on environment is chiefly due to the need to manipulate energy. A distinction is drawn between solar-powered ecosystems, human-subsidized solar-powered ecosystems and fuel-powered urban-industrial systems. Humans manipulated the transposing ecosystem process by transforming into agroesystems by channeling energy into specific plant or animal harvest for human consumption.

Latter has become increasingly necessary in order to sustain population growth and urban industrial systems, and iinvolves a considerable addition of fossil-fuel energy. The emergence of fuel-powered urban-industrial systems, a process that began with the industrial Revolution, generated new agents of environmental change, e.g. large-scale mineral extraction and fossil-fuel consumption. Moreover, there was shift in the distribution of population from rural areas to urban centers. Mineral extraction created environmental change by disfiguring landscapes and polluting drainage network. Such impacts tend to be local in contrast to the global impact fossil-fuel use. Expansion of urban and industrial areas crested new phenomena, i.e. flash floods and mud flood.

The extent of human ingenuity employed in the manipulation of ecosystems and the resulting range of agroesystems are quite remarkable. Some agricultural systems may rely almost entirely on solar energy whereas others are characterized by a massive fossil-fuel energy subsidy. Whatever forms it takes, agriculture is major agent of environmental change, possibly the most significant agent. The nature and organization of agricultural systems are responses to cultural stimuli, which operate within the constraints of the physical environment. The stimuli may include population growth rates, availability of markets, and the need to generate foreign currency and the desire for food security, which relates to political superiority.

The responses may include increased energy inputs through scientific and technological developments, e.g. pesticides and fertilizers, an increase in land clearance and a decrease in the length of fallow periods. The practice of agricultural caused the removal of a significant proportion of topsoil, which resulted in land degradation. This increases the siltation in the river systems, which can contribute to flash floods and mud floods. Arguably, land degradation is the single most pressing current global problem. As a result of remote sensing evidence we know that since 1945 1.2 billion ha, an area roughly the size of China and India combined, have been eroded at least to the point where their original biotic functions are impaired. Decline in potentially cultivable land leads farmers to cultivate steeper and steeper slopes. This may cause lands slides on hill slopes.

Landslide may not be as spectacular or costly as earthquakes, hurricanes or some other natural disasters. However, landslides are known to cause just as much if not more damage as any other geological hazard. We should know, as Malaysia has had its fair share of catastrophic landslides, Putting aside property damage, it is the loss of lives that is most devastating. Back in December 1993, the Highland Tower tragedy claimed the lives of 48 men, women and children (including an infant). One of the three blocks of condominium at Highland Tower in Hulu Kelang, Selangor toppled following a massive landslide, which swept away the foundation of the building?

The mass movement processes that are most common in the Wairoa District are shallow slip and earthflow erosion. There is considerable evidence for frequent shallow slips under natural conditions (Clough, Hicks, 1992). Slipping is induced by short intense rainstorms or prolonged wet weather. The magnitude of slipping in any event is complex. Slipping under pasture occurs more intensely than under forest for storm events of the same magnitude. Therefore, average levels of slipping under pasture are between two and ten times greater than under indigenous forest or scrub (Clough, Hicks 1992).

In June 1995, the infamous Genting bypass landslide took the lives of 21 people. The incident gained notoriety after Works Minister Datuk Seri S.Samy Vellu attributed the cause of landslide to an "act of god," In August the following year, an orang Asli settlement in Pos Dipang, Perak was swept away by a torrent of water and debris from a nearby hill. The incident claimed 44 lives, and caused extensive damage to the settlement. Another case of "divine" intervention, perhaps? Events that are even more devastating can be traced throughout history. An incident in Aberfan (pronounced Abervan) in 1966 is a classic example of how indiscriminate mining resulted in the loss of life of over too children and adults.

Aberfan in Cardiff, Wales, was at one time a peaceful hillside town until coal was discovered in the mid 1800s. From then on, shafts were sunk to mine coal waste sky high. Some of the piles, known as tips, reached over 50m in height. These tips of coal waste were a disaster waiting to happen. On October 21, 1966, one of the tips started to move down the hill. A slow, almost unnoticeable slide then came crashing down within minutes, engulfing a school and a number of farm hoses. In its aftermath, 144 people died, of whom 116 were children.

Landslide occurs when masses of rock, earth or debris move down a slope. Landslides may be very small or very large, and can move at slow to very high speeds. They are triggered by storms, fire and human interference with the land. Landslides occur as a result of rainstorm, earthquakes, volcanic eruptions, and various human activities.

Mudflows (or debit flows) are rivers of rock, earth, and other debit saturated with water. They develop when water rapidly accumulates in the ground, such as during heavy rainfall. They change the earth into a flowing river of mud or "slurry". Slurry can flow rapidly down slopes or through channels, and can strike with little or no warning at avalanche speeds. Slurry can travel several kilometers from its source, growing in size at

its picks up trees, cars, and other materials along the way. Mudflows tend to flow in channels, but will often spread out over a flood plain. They generally occur in places where they have occurred before.

A mudslide one type of landslide, is a sinkhole. Steep hills and mountains are often the sites of land and mudslides. Many things weaken slopes on these hills, and mountain. Erosion by rivers, glaciers or ocean waves and fire leave slopes bare and vulnerable to heavy rain. Snowmelt can saturate the ground, and earthquake weakens the structure of the slope. Volcanic eruption produces loose ashfalls that deposits debris on slopes. The weight of snow, stockpiling of ore, waste piles, and even building can put stress on weak hillsides.

Once a slope is weakened, almost anything can set a landslide off. Rain, earthquakes, and even blasting are common causes. If the hillside is dry, dirt and rocks can tumble the grade. If however, the slope is saturated with water, a mudslide occurs. This more destructive flow can pick up rocks, trees, houses and cars. As the debris, moves into river and streambeds, bridges can become blocked or even collapse, making a temporary dam that can flood neighbouring areas.

Land management often causes landslides, mudflows and debris flow problems. Improper land-use practices, particularly in mountain, canyon and coastal regions, can create and accelerate serious landslide problems. Landslides happen in areas that have very weak or stressed material resting on steep slopes. Even gentle hills can slide if the conditions are right. If you are in area that has a history of landslides, be aware of the signs that will alert you to the possibility of a landslide.

The causes of artificial landslide lie in the way soil has been cut or banked. The speed of a landslide varies greatly, ranging from a slow rate of one cm a year to a speed of several meters a day. The speed can change over a period of time. In the case of landslide covering a wide area, several slides may take place at the same time, each one having its own rate of slippage.

In may 1970, an earthquake in Peru claimed about 70,000 lives, of which 20,000 perished as a result of the debris avalanche from the north peak of Nevado Huascaran. During the period 1971 -75, some 19,000 lives were lost in earthquakes, tsunamis, volcanic eruptions, landslides, and show or ice avalanches. About 84% of the casualties were attributed to earthquakes and 14% to landslides.

Annually, direct or indirect costs or landslides in the US have been estimated to exceed US$1 billion. Landslides and mudflows sometimes strike without warning signs, only taking notice when it is too late. The force of rocks, soil, or other debris moving down a slope can devastate anything and everything in its path. Landslides should never be taken lightly.

1.5 CONCLUSION

What is certain is that environmental change will continue to occur but what is uncertain is the direction and rate of change at all scales from the local to the global. Global change poses an enormous challenge for environmental science. In short, term it seems likely that global warming will ensue and the resulting regimes of temperature and precipitation will alter the patterns of the world's biomes and agricultural systems. Land use professionals must play an active role to minimize the impact caused by land use changes on environment.

The future land use planning must consider the importance of proper planning. This can contribute towards minimal environmental disasters. On an optimistic note, there are some encouraging signs, which imply that civilization is at least beginning to recognize the necessity of achieving a symbiotic and sustainable relationship with the environment. This is manifest in the technology available to reverse some of the undesirable effects of human activities. Examples include the reclamation of derelict land, pollution abatement and measures to combat acidification, salinisation, and desertification and soil erosion. The late twentieth century has witnessed important advances in environmental improvement and conservation but the challenge remains monumental. Moreover, the challenges involve each person, not environmental scientists. Reducing population growth rates must be a major target; although the relationship between population numbers and environmental impact is not straightforward, because of different levels of resource use associated with varied standards of living, population control will reduce environmental pressures and increase the possibility of sustainable development.

Another cause of optimism is the increasing significance of the environment as a political issue at all levels and for all shades of political activity. Some of this has been prompted by the increased media coverage of environmental problems and the ease with which information transmitted around the globe. The lessons from the past also highlighted the need for precautions when developing new land and new technologies.

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