



# An ecological analysis of four competing approaches to sustainability development

## Integration of industrial ecology and ecological anthropology literature

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### Abstract

**Purpose** – The purpose of this paper is to trace the impact that the ecological approach has in international development programs in both the USA and Europe. It discusses the applications of sustainability by international donor agencies among bilateral and multi-lateral organizations in developing economies. It outlines the influence of sustainability in the US Federal Government agencies to protect and maintain environmentally-based development programs.

**Design/methodology/approach** – The paper compares industrial ecology and ecological anthropology approaches to sustainability development. It discusses their policy implications for international development assistance programs. It describes how anthropological and sociological approaches to sustainability have impacted the development policies and programs of bilateral and multilateral organizations, as well as those of multi-national corporations.

**Findings** – There are common sustainability trends among the four competing donor organizations in approaching sustainability development by bilateral and multilateral international development organizations. These organizations – the United States Agency for International Development (USAID), the World Bank, the United Nations and its affiliated Organizations, and the US Federal government agencies, for example, the Environmental Protection Agency – have shaped and influenced the policies and programs of sustainability development in business organizations and in developing economies.

**Originality/value** – Sustainability has been a subject of interest in international development assistance programs in both bilateral and multilateral organizations since the 1970s. Over time, the subject of sustainability received prominence in the developed world. It can be argued that sustainability has its roots in the developing economy and has been adapted/modified to meet the environmental and natural resources conservation and management policies of the developed economies.

**Keywords** United States of America, Europe, Sustainable development, Resources management, Sustainability development, Ecology and resources management, Sustainability business reporting, Social anthropology

**Paper type** Research paper

### Introduction

Sustainability development is an interdisciplinary area of study. It is not a discipline *per se* because it has no established theory and research method. It has been a subject that has attracted many different social, biological and environmental sciences disciplines. Historically, the subject of sustainability has its roots in the engineering sciences, particularly in civil and agricultural engineering. When engineers were designing roads, bridges, dams and irrigation projects, they focussed on the long-term impact of sustaining these projects without altering the livelihood of the local



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population. In biology, the subfield of evolutionary biology examined the issue of sustainability among species: plants and animals. Sustainability has its original basis in evolutionary biology which has been shaped by the Darwinian theory of evolution and natural selection.

### **Research contributions**

The Darwinian evolutionary approach became popular in economics (agricultural and resource economics), sociology (rural sociology and human ecology), anthropology (ecological anthropology) and organization management studies (population ecology) to explain the evolutionary growth and development process of communities and societies. The research identifies common trends of sustainability development among these four competing approaches by bilateral and multilateral international development organizations, the US Federal Government, and business organizations and how has shaped and influenced sustainability policies and programs. The paper also traces the impact that the ecological approach has in international development programs in both the USA and Europe, its application in international donor agencies among bilateral and multilateral organizations in developing economies, as well as the approaches of various US Federal Government agencies to protect and sustain environmentally based development programs.

The paper is divided into four sections. The first section provides an overview of ecological approaches to organization. The second outlines industrial ecology and ecological anthropology approaches to sustainability development and their use in international development agencies. The third section compares the four competing approaches to sustainability with emphasis on that of business organizations, because they shape sustainability accounting and reporting. The last section is the conclusion which highlights current developments in accounting guidelines for expanding comparable integrated sustainability reporting of economic, social and environmental performances.

### **An overview of the ecological and environmental approaches of organizations**

The ecological approach is modeled on the Darwinian theory of evolution and natural selection to explain societal growth and development such as competition, environmental determinism, sustainability as well as organizational birth, decline and death. Ecology focusses on populations of organizations and examines the effect that the environment, market forces, technology, natural resources and geographical locations have on organizational change and development processes. It places relative weight on internal and external environmental conditions as the determining factors for organizational forms and structures and for both growth and maturity as well as mortality rates. While the subject of the study and research problems may vary among the social science disciplines, most ecological studies have addressed populations or groups instead of units or individuals as their basis of analysis to study social, economic, cultural and political systems as well as human organizations. In essence, the ecological approach of organizations is to view communities where interdependency relationships among multiple and diverse populations affect the rise and fall of organizations and shape the conditions that promote their mutual homogeneity, diversity, stability, change and growth (Astley, 1985, p. 114).

Ecology surfaced in many disciplines: anthropology, sociology, economics, geography (and other related disciplines) have emphasized the importance of

sustainable growth and development strategies. Organizational ecology focusses on the broader environment – community, nation, ecosystem, and planet. It addresses the imbalance resulting from pollution, environmental degradation, and damages to the ecosystem.

An evolutionary ecological analysis integrates sustainability with community development plans, resources management, geographical locations, and boundaries (Wilbanks, 1994). This approach is consistent with the view that business organizations as living systems are in a constant sustenance mode of operation in order to adapt their economic growth and industrial development strategies with community social well-being and cultural development programs. Thus, sustainability becomes an important subject area of study within industrial ecology and ecological anthropology.

### **An integrated approach of industrial ecology and ecological anthropology frameworks of sustainability**

This section presents the two approaches to sustainability development that have impacted the development programs and initiatives of international donor organizations in developing economies in the USA and European countries. Both approaches stress the importance of sustainability and the need for conservation of natural resources and protection of the environment. The differences are in their foci: on the one hand, industrial ecology focusses more on industrial sectors and organizational emphasis on sustainability; on the other hand, ecological anthropology addresses the balance between economic growth and the promotion of sustainability in developing countries.

#### *I. Industrial ecology*

Ehrenfeld (2000) laid the basic foundation and underlying principles of ecology, industrial ecology, and sustainable development connections as follows: “Ecology is fundamentally a science of living systems. Ecology focusses on the interconnections and community character of a system and seeks to identify and characterize the web of energy and natural flow that maintain its health.” Industrial ecology attempts “to understand the intricate web of energy and material flows and discover the rules that govern robustness and resiliency in such systems” of industrial societies. This knowledge becomes instrumental “for designing more effective technologies and institutional structures” to adapt organizational technologies to societal growth and development (Ehrenfeld, 2000, p. 239).

Industrial ecology has normative assumptions about human behavior that involve cooperation, competition, conflict, and interdependence in managing sustainable development. Interdependence involves exchange which is relational and dependent on human and community interdependency relationships. It involves adaptation and sustainability as a continuous process.

Industrial ecology thus deals with organizational and human connection in both business and organizational development, and in commerce and industry in a sustainable manner where energy materials and natural resources flow between businesses and their communities. Industrial ecology as a humanistic and social interventionist approach promotes the integration of a balanced management between resources exploration and their better use to protect the environment. According to Cohen-Rosenthal (2000), “industrial ecology is an intervention at the organizational and social level” (p. 250). There is human intervention in natural ecology to ensure that

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technological innovations are used to explore new connections, create new possibilities, and enable managers to make responsible choices in sustainable ways. In industrial ecology, the notion of exchange and interconnection of economic benefits between industrial development and environmental management is important. Because of synergies, organizations can improve resources utilization and conservation that would encourage competition and social responsibility.

As a result of organizational learning, employees acquire new roles and behaviors, working relationships, cooperation, and new approaches to solving problems. Through adaptive behavior and continuous learning, management and employees can share new information, develop networks, form teams, and improve mutual communication. Industrial ecology becomes central in developing human resources skills, knowledge and training, learning new behaviors and roles that increase employees' awareness, environmental responsibility, and their relationships to business performance and profitability objectives. It is this social dimension of industrial ecology that becomes central in organizational and environmental relationships.

Cohen-Rosenthal (2000) described the relationship as follows: "Social aspects of industrial ecology stretch beyond the interorganizational relationships within a symbiotic connection or eco-industrial cluster. The environment in which industrial ecology operates includes the larger community and social context. These factors can be enabling or inhibiting to achieving broad goals for industrial ecology" (p. 251). Thus, it can be inferred that strategies which enhance industrial performance/profitability can be linked to global welfare in broader terms. Accordingly, "profit-maximizing strategies are linked to strategies that improve public welfare." The use of social processes whereby the broader communities are involved can become "essential for effective strategy development and implementation" (Cohen-Rosenthal, 2000, p. 252).

The interrelationships among environmental management, industrial growth, community development and societal changes have been described by Bailey (1998) as open and interactive systems whereby:

[...] society inevitably transforms its environment while adapting to it, just as the environment transforms the society. Thus, each stage in the cycle of societal-environmental relations sees successive transformation of both the society and environment. The society, as it grows, transforms the environment (positively as well as negatively) and in turn the transformed environment has further impact on society – in reality a changed society (p. 423).

In an open system, the boundary of a society is defined by a political border that defines the internal resources including land, water and all available natural resources (Bailey, 1998, p. 423). Open systems facilitate the simultaneous growth of both agricultural and industrial development in differing degrees within communities (Sisaye and Stommes, 1985). When communities interact outside the political border, they exchange and trade their internal resources to obtain external resources that are not available within their political boundaries. Communities can sustain economic development and minimize dependency of external resources through technological innovation and industrial growth.

Industrial ecology's goals of community growth, social welfare and environmental management are linked to sustainable development and cultural change. Both industrial ecology and ecological anthropology assume that sustainable development is an evolutionary process that transforms societal development over time. Accordingly, they both incorporate the study of cultural and economic development,

industrial and business growth to the social systems adaptation process. These social systems include population and their surrounding natural environmental resources. From an ecological anthropology perspective, political systems, culture, language, beliefs and religion become part of the social and political systems, technology, organization systems, and accounting information that constitute human ecology.

## *II. Ecological anthropology*

Ecological anthropologists have long recognized the role of politics among tribal and ethnic groups to explain agricultural land use, farming practices, pastoral herding activities and population migration movements. Politics governed human-land relations and interactions with the natural and social environment. In these ecological relations, class and economic structures regulate social and political order, and environmental resources management. The process of natural selection influences the social behavior and interactions among groups, physical adaptations, and the social structure of organizations (Gray, 2006; Pierce and White, 1999). The process of natural selection and sequential adaptation to the environment involves physical and psychological adaptation. While political evolution involves the process of environmental and structural changes, social change and adaptation focusses on ecological anthropology involving culture, people, and in general sociocultural systems.

Ecological anthropology examines human adaptation, cultural change and diffusion in relation to environmental and technological changes (Bozzoli, 2000). In doing so, it recognizes the role of culture as providing distinctive set of values and norms among groups. Culture, in essence, has become the main force behind humans' adaptation to the environment. In other words, cultural practices contribute to differences in local and regional systems. However, information technology and communication have spread across cultural and social boundaries and have minimized cultural barriers among groups of populations (Kottack, 1999; Dietz and Burns, 1992; Feldman, 1986, 1988; Haenn, 2000).

Technological development has eroded cultural differences as well as altered the quality of life and way of living among cultural and population groups. Deforestation, irrigation, commercial farming, business development and population growth have changed the local living conditions, and in some cases to environmental degradation. The focus on ecological anthropology is not only on conservation policy, but on social soundness approach to development programs that pays attention to the needs of the people. Kottack (1999) has related the social soundness analysis (SSA) approach to "sustainable development aims at culturally appropriate, ecologically sensitive, self-regenerating change" (p. 26). SSA has implications in the development and preparation of management accounting sustainability reports that promote environmental resources conservation (Sisaye *et al.*, 2004).

Sustainability has economic, technological as well as market development dimensions and social components to safeguard and protect the environment and natural resources. Therefore, sustainability implies responsibility by those who are in power to protect the environment, to use ecological resources in a manner that is morally and equitably sharing for the benefits of humans and other species for today and in the future. There is a consciously intended social aim to use resources morally and responsibly to manage long-lived living systems. Environmental management enhances sustainability by linking environmental resources management "to quality, production, service and managerial systems" (Cohen-Rosenthal, 2000; Ehrenfeld, 2000).

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It promotes organizational learning where employees are trained and made aware of the importance of environmental issues and natural resources conservation. Accordingly, sustainable development and sound environmental management comprises the primary components for establishing environmental, industrial ecology and anthropological relationships.

For example, Selznick (1969/1980) suggested that institutional adaptation systems of organizational structural behavioral characteristics of communication, authority, management relations, social roles and sources of power are necessary for continuity and system maintenance of a stable organization (Perrow, 1986). These assumptions are consistent with industrial ecology framework which argued for sustainability growth and development in stable and functional social and cultural organizational systems. In situations where there are conflicts of interests on growth and sustainability issues, it is inherently functional for coalitions to behave as cooperative groups to lobby governmental regulatory organizations to enact environmental legislations to monitor industrial growth so that growth does not come at the cost of sustainable development.

Accordingly, both industrial ecology and ecological anthropology have normative assumptions about human behavior that involves cooperation, competition, conflict and interdependence in managing sustainable development. Interdependence involves exchange which is relational and dependent on human and community interdependency relationships. It involves adaptation and sustainability indefinitely on a continuous process.

Ecology and sustainable development received prominence in the 1970s when economists suggested that existing natural resources create potential limits to growth. A group of economists from the Massachusetts Institute of Technology argued in the early 1970s that current rate of population growth could adversely affect food and industrial production, environment (pollution), climatic conditions and geographical location (Meadows *et al.*, 2004). There came the realization that in economics, the national income and product accounts would be extended to include non-market accounts, for example, air and water quality beyond consumer products with market accounts. This allows the development of parallel indicators for non-market accounts similar to near-market accounts. The development of green accounting provided systematic recording and reporting of assets and production activities associated with natural resources and the environment.

As social science disciplines, both industrial ecology and ecological anthropology address sustainability within the context of organizations and the broader environment – community, nation, ecosystem and planet. These are organizational ecological issues addressing the imbalance from pollution, environmental degradation and damages to the ecosystem. The industrial ecology and ecological anthropology approaches to growth, development and interdependencies are embedded in several social, agricultural and biological sciences disciplines, for example, in economics (agricultural and resource economics), sociology (rural sociology and human ecology), geography and organization management studies (population ecology) (refer to Aldrich, 1979; Astley, 1985; Bozzoli, 2000; Carroll, 1984; Cohen-Rosenthal, 2000; Ehrenfeld, 2000; Pierce and White, 1999; Singh and Lundsden, 1990; Stone, 2003; Vondal, 1988; Wilbanks, 1994). Sustainability development became an integrated subject of study from various social disciplines. The multidisciplinary approach to sustainability growth has thus been incorporated in various reports and programs advocated by international development organizations.

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## **A comparison of four competing approaches to ecological and environmental resources management of sustainability growth and development**

As indicated earlier, the ecological approach, which subscribes to the Darwinian theory of evolution and natural selection received prominence in the 1970s when economists suggested that existing natural resources create potential limits to growth, and that the current rate of population growth could adversely affect food and industrial production, environment (pollution), climatic conditions and geographical location (Meadows *et al.*, 2004). Organizational ecology which focussed on the broader environment – community, nation, ecosystem and planet expanded the limits to growth by addressing the imbalances from pollution, environmental degradation and damages to the ecosystem. Ecology, which later surfaced in many disciplines: anthropology, sociology, economics, geography and other related disciplines, brought the importance of sustainable growth and development strategies among international development and business organizations.

The recent focus and emphasis on sustainable development suggests that there are at least four parallel approaches that have emerged from the early 1970s until the late 2000. These approaches have significantly influenced sustainability development efforts in both the USA and Europe, its application in international development agencies among bilateral, United States Agency for International Development (USAID), and multilateral organizations, such as the World Bank for Reconstruction and Development (World Bank) and several environmentally based development programs within the US Federal Government agencies, such as the US Forest Service, Environmental Protection Agency (EPA), among others. The fourth approach discusses the business organizations view of sustainability development and reporting.

### *I. Sustainability within the context of international bilateral development organizations*

The most important bilateral organization that has significantly influenced sustainable development is the USAID (2002, 2010). USAID laid the foundation of sustainable development in its SSA report that was prepared by anthropologists to guide agricultural and industrial development efforts in developing countries (see Hoben, 1982; Hoben *et al.*, 1996; Mog, 2004; Vondal, 1988). The SSA framework of sustainable development is a subject where social and ecological anthropologists address development issues as encompassing economic goals, social justice/equity, survival, responsible environmental management and cultural development (Bozzoli, 2000; Stone, 2003). They argued that social and cultural development in development assistance programs can become successful and impact progress when local population are directly involved in the planning administration of these development programs.

Similarly, the Organisation for Economic Cooperation and Development (OECD) that has 34 member countries including USA, Canada and Japan) is based in Paris (OECD, 2010). It has continued its historical foundation of reconstructing Europe under Marshall Plan after the Second World War by extending the European Commission organization's expertise in conducting most of the work that support sustainable economic development and assist countries economic development programs.

### *II. Sustainability within the context of international multilateral development organizations*

The World Bank is an example of international development multilateral agency that has incorporated sustainability within the context of Social Assessment (SA) guidelines (World Bank Group, 2003). The World Bank uses SA as a general framework like the

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USAID's SSA framework where the bank consults with social anthropologists to assess the management of a development program and its social impact on stakeholders – employees, customers and organizations as well as communities. The World Bank has used SA as a tool to incorporate social analysis and participation of local people into project and analytical work. SA combines systematic procedures to analyze socioeconomic variables and processes with the purpose of assessing impacts and risks, mitigating adverse impacts, enhancing positive impacts and developing the institutional conditions for social change and development (Sisaye *et al.*, 2004).

Sustainability development within the context of The United Nations Development Programme (UNDP) also parallels that of the World Bank (UNDP, 2010, p. 61). The UNDP, which is headquartered in New York City, supported the Report of World Commission on Environment and Development (WCED) – Brundtland Commission Report: *Our Common Future*, published in 1987. The Brundtland Report is the most noted sustainability report which gave credence to the importance and recognition of sustainability growth and development. It defined sustainability as “the ability to meet the needs of present generations without compromising the ability of future generations to meet their own needs.” The report advised policy makers and international donor organizations to envision a future in which the threats of environmental destruction are minimized, where all people of the world enjoy economic stability and social equity (redistribution) between and within generations.

The Brundtland Report (1987) increased the awareness of world leaders and development experts of the importance of ecological resources and human beings dependency on the environment to meet their needs and well-being. It suggested a balanced economic approach to utilize or exploit resources by considering the impact of development on the environment and for human beings' security, well-being, current and future growth. It suggested that if natural resources are not properly managed, there will be environmental degradation, which will exacerbate existing poverty problems, and threaten people's health, livelihood and survival for now and future generations (Brundtland Report, 1987, pp. 39-40). To mitigate the unanticipated consequences, it articulated a sustainability management development effort that is long term, continuous, not a one-time improvement or action program advocating specific policies or changes.

Similarly, the Food and Agricultural Organization of the United Nations (FAO, 2010) (Rome) branch promoted sustainable agricultural development in the developing countries by supporting high-yield variety crops, fertilizers, agriculture credit, expert advice and extension programs directed to rural development.

The International Labour Organization (ILO) headquartered in Hague, the Netherlands advocated the International Fair Practice Employment and Labor Standards as part of its sustainability development efforts for child labor protection and equal pay for equal work initiatives in the developing world. It supported The United Nations Global Compact (UNGC, 2009), which is a strategic policy initiative for businesses committed to aligning their operations and strategies around four sustainability objectives. They are:

- (1) the Universal Declaration of Human Rights;
- (2) the ILO's Declaration of Fundamental Principles and Rights at Work;
- (3) the Rio Declaration on Environment and Development; and
- (4) the United Nations Convention against Corruption.

The ILO supported the International Organization for Standardization (ISO), i.e. the ISO 9000 certification, which developed a set of procedures, guidelines and standards for multinational corporations to adhere to certain standards dealing with improved labor standards and protection, equal pay and workers' rights (child labor and safe working conditions), anti-corruption act (ILO, 2006, 2007). It required companies to provide documentation, showing that they have developed record keeping systems required for ISO certification. The certification became the standard for recognition of quality product and services. It later revised and introduced ISO 14000 for environmental management system documentation, which addressed the world's depletion of natural resources and the environmental risks associated with industrialization. It required participating companies to keep track of raw materials usage, the generation, treatment and disposal of their hazardous wastes; emission control; and continuous improvement plans. It set guidelines on pollution emissions and set guidelines for companies to prepare ongoing improvement plans in their environmental performance.

The ISO 14001 certification advantages of sustainability ranges from corporate mandate, to regulatory considerations, to environmental benefits. It provided framework for members' business organizations to satisfy and fulfill external requirements related to customers, improved relationship with governmental agencies, improved stakeholder responsibility, positive publicity and competitive advantage and reduced insurance premiums. While these sustainability development efforts have been popularized among the international bilateral and multilateral organizations, in the USA, the Federal Government has also instituted sustainability and environmental management initiatives to regulate and conserve natural resources in several departments and agencies that are administered by the government.

### *III. Sustainability within the US Federal Government agencies*

The environmental movement in the USA has contributed to the legitimization and institutionalization of environmental resources conservation concerns within the US Federal Government agencies (McLaughlin and Khawaja, 2000). The most notable government agency that has regulatory power over business development practices which could effect on the environment including pollution, hazardous waste and other environmental resources is the EPA. The EPA was established by the Nixon administration in the early 1970s in response to the call for natural resources conservation and protection of the environment. EPA received regulatory power to enforce conservation, environmental protection and promote sustainability development. The EPA has defined sustainability as "the ability to achieve continuing economic prosperity while protecting the natural systems of the planet and providing a high quality of life of its people" (US EPA, 2010).

In addition to EPA, there are also other Federal Government agencies that promote sustainability. Several US Federal Government agencies conduct Social Impact Assessment Reports to evaluate the impact of business development programs that have impact on ecological resources including the environment. For example, the USDA Forest Service (2010) is involved in natural resources management programs that sustain parks, forest, vegetation and recreational centers – camps, trails and other natural recreation centers. Similarly, the National Oceanic and Atmospheric Administration (NOAA Fisheries Service) has programs that promote habitat conservation and sustaining of marine services, support oil exploration as well as protection of local sustainable economy: fisheries and related development (US Department of Commerce, NOAA, 2010).

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The US Department of Commerce has established the Malcolm Baldrige Award to recognize organizations that have achieved excellence in the delivery of their products and services in the 1990s. The award has recently established the Community Impact Assessment Report that recognized sustainability development as one of the criteria to be included in the quality award. The quality award has extended beyond business organizations. It has recently included not-for-profit (NFP) organizations including colleges and universities that have met the award criterion of excellence in service and products, but also in sustainability development efforts that support local, regional and self-help community development programs (US Department of Commerce, National Institute of Standards and Technology, 2010).

#### *IV. Sustainability approaches in business organizations: recent developments*

The fourth competing approach to sustainability is related to recent developments in business organizations program in sustainability accounting and reporting. The business approach to sustainability has been largely shaped by the sustainability programs and policies of international bilateral and multilateral organizations as well as the US Federal Governmental agencies that have regulatory control over business activities. Government regulatory organizations, particularly the EPA has shaped environmental regulations and legislations that required business organizations to meet governmental standards of pollution and institute programs that conserve the exploitation and use of natural resources (US EPA, 2010).

The EPA has issued guidelines on Carbon Disclosures Project Leadership USA (Carbon Disclosure Project USA, 2009) Index, greenhouse gas reporting and registers (see Pew Center, 2011; Securities Exchange Commission (SEC), 2010), and environmental liabilities that outlines the definitions and categories of those liabilities. This has been followed by generally accepted accounting principles: statements on Accounting for Environmental Liabilities, Contingent Liabilities and Asset Retirement Obligations. This act required business organizations to recognize and report corporations' environmental liabilities associated with business innovations and growth, including accounting for loss contingencies and for asset retirements.

Environmental preservation and resources conservation has thus now become the main development efforts of business organizations, particularly to those organizations whose business is in oil, gas and other types of natural resources utilization including coal and petroleum, as well as for manufacturing organizations in the automobile, steel and mineral extracting industries. As a result, there has emerged an overlap of concerns among many business organizations on issues of sustainable growth, ethics and corporate social responsibility. To some extent, sustainability has been embedded in environmental and ecological ethics where the concern for natural resources conservation and utilization has been intertwined with land ethics. Accordingly, sustainability has been integrated with environmental and natural resources management and has formed the core foundation of ecological ethics (Sisaye, 2011a, b). Corporations have thus incorporated sustainability as part of their strategic planning process (Stroufe and Sarkins, 2007). Accordingly, strategic sustainability management has become central for corporations where examples of best sustainability practices among business corporations are recognized by the media, press and other forms of mass communications.

In accounting, sustainability has been labeled as green accounting that provides systematic recording and reporting of assets and production activities associated with natural resources and the environment (Hopwood *et al.*, 2010; Lamberton, 2005;

Schaltegger and Burritt, 2006). Similarly in economics, the national income and product accounts have been extended to include non-market accounts, for example, air and water quality beyond consumer products with market accounts. This has the potential for the development of parallel indicators for non-market accounts similar to near-market accounts. Accordingly, these innovative changes in environmental management and accounting reporting systems become one of the main core competencies of socially responsible organizations, particularly in technology and manufacturing firms, characterized by a highly competitive environment. To remain competitive, these organizations continuously adopt policies that support the development and reinvention of new products and services to enhance continuous changes and adaptation in environmental and natural resources management.

*a. Business stakeholders and corporate environmental programs.* Business stakeholders, including customers have shown appreciation to corporate environmental programs. More recently, socially conscious and affluent customers have expressed preferences to invest in companies whose investment portfolios included sustainable development and ecological conservation policies (Koellner *et al.*, 2005). Accordingly customers have responded positively and are willing to pay a premium for products and services delivered by companies with reputable environmental sustainability programs Sustainable Asset Management (SAM), 2010; Sustainability Index, 2010). For example, paper and bottle recycling companies are advancing social and environmental causes by working with NFP organizations. They are placing garbage collection facilities in parks and recreational areas. They also provide sanitation training to public and NFP employees. They work closely with service sector organizations, for example, hotels and restaurants to promote water conservation and marketing of green-based products. These reform efforts also have been supported by governmental policies and international organizations in their resource allocations to advance the development of environmentally sound technological innovations. When marketing strategies that focus on cultural and humanistic values are used to promote product sales, increase market share and coordinate synergy of production, marketing and distribution linkages, they contribute to the advancement of both environmental management, and improved business competitiveness and financial performance (Dilling, 2009).

Environmental concerns have attracted public interests and desires. It is, therefore, critical that top management recognizes the importance of ecological management programs as mechanisms in resolving contending environmental issues among several interest groups. Environmental management can thus become part of any organization's best management practices. The principles of sustainability have become sources of legitimization that are embedded in corporate citizenship and responsibility and accountability. Accordingly sustainability has served as operating guidelines to increase the frequency of corporate environmental and social disclosures to their stakeholders (i.e. institutional investors).

*b. Sustainability accounting and reporting.* The traditional (conventional) financial accounting rules have focussed on measuring the financial resources (assets), debts (liabilities), owners (stockholders) equity, as well as the sources of revenues and expenses reported in the income statement. Financial accounting reports in general present a static/technical view of business, which is consistent with functional assumptions that organizations support incremental changes to maintain stability of systems to manage and control environmental and social responsibility goals. Nevertheless, these incremental environmental reporting changes have enabled

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organizations to satisfy their ethical and social responsibility goals as well as meeting investors concerns and governmental regulatory agencies external reporting requirements (Hubbard, 2008; Herzog, 2010; Isenmann *et al.*, 2007). Although the trend has been toward increased environmental reports, there is a lack of reporting consistency among organizations in the same industries or markets for comparing performances.

Ecologically responsible companies have provided descriptive and in some instances detailed social and environmental disclosures in their annual reports to document their sustainable management strategies (Wiedmann and Lenzen, 2006). They have reported their sustainability use of environmental resources, including energy conservation, development of alternative sources of energy and management of non-renewable energy sources such as oil, petroleum products, natural gas and coal as well as renewable energy sources such as trees (Dilling, 2009). Many institutional investors have supported sustainability programs of corporations, because they anticipate positive economic returns in their investments. They have shown appreciation to invest in corporations that are listed in the Dow Jones Sustainability Index (DJSI) (see DJSI, 2008, 2009, 2010; Morgan Stanley, 2010; SAM, 2010; Sustainability Index, 2010). They perceive the benefits obtained from socially responsible investment policies outweigh the costs associated with these investments.

*c. Accounting legitimacy, and the birth and bureaucratization of accounting rules.* When organizations incorporate sustainability growth strategies in cost and management accounting systems to remain competitive and profitable, they have adopted process innovations in their business operations. Overtime, when these changes are institutionalized, they provide legitimacy for sustainability accounting and reporting systems. Organizations justify legitimacy to generate prescription of rules, routine procedures and to define supporting functions to guide their daily operating activities. Overtime, when accounting rules become close to the core of the organizations' administrative activities, they tend to become mechanistic and shielded from external environmental changes.

Although business environmental changes necessitate changes to accounting systems, for example, sustainability reporting, however, the impact of these changes in accounting regulations has been limited. These rules have become bureaucratic when they perpetuate and co-opt into existing administrative procedures. The low-level density effect of accounting rule making coupled with mechanistic (repetitive functions) in accounting systems have made accounting operations subject to more formal and technical administrative rules. In general, accounting lacks ambiguous rules like norms, beliefs and culture unlike other administrative areas that are more open, adaptable and amenable to rule changes as circumstances warrant in addressing current emerging situations. When organizations face environmental uncertainties, they use accounting rules and regulations as operating mechanisms to maintain organization stability and preserve the existing status quo.

To this effect, Schulz (1998) stated that: "as lessons from past experiences get encoded in rules or other systems of automated responses, new experiences become scarce. As a result, learning through further codification of experiences declines. Making rules and routines helps organizations respond to problems in a programmed and efficient way, but, at the same time, rules create a dangerous sense of familiarity with arriving problems that reduces the likelihood that new problems will be seen as opportunities to draw new lessons" (p. 872). However, incremental changes in accounting reporting systems, including sustainability reporting, have prescribed to

the functional assumptions that assumed although accounting systems are inert, less flexible and resistant to change; inertia in accounting is a relatively short-term phenomenon amenable to environmental changes. The functional assumptions presume that there is a growing interest among accountants to integrate sustainability into financial and managerial accounting reports as long as these reports satisfy and meet the reporting requirements of both external and internal users (Sisaye, 2011a, b).

Sustainability-related strategic planning and performance issues have thus linked sustainability with corporate strategy where there evolved rethinking of the corporation resources as being shared by all stakeholders, not only by shareholders (Bansal, 2005). Sustainability thereby creates wealth for all groups including the society and the community where the corporation is founded and/or located. There is the concept of merging private corporate profit and public good to commonly share as practiced in some of the emerging economies that have instituted micro-small business lending programs to start community projects: like dams and irrigation projects (Mog, 2004). These practices combine private business interest with the public goods to promote sustainability philosophy, environmental responsibility, social responsibility, community benefits and public safety. There is an emphasis on stakeholder analysis that defines and identifies the value chain between internal organizational wealth creation for employees, managers as well as shareholders and external stakeholders including benefits for community members, and government agencies, which extended the trickle bottom down effects of sustainability growth (Gray, 2006). These are defining procedures and key performance indicators for community welfare and corrective action measures to counter the effects of unbalanced economic growth by promoting equity, redistribution and improved quality of life for all citizens.

### **Conclusion – sustainability accounting and ecological resources management**

Sustainability development and reporting has undergone evolutionary changes overtime. In this paper, an industrial ecology and ecological anthropology perspectives are used to account the four simultaneous approaches of sustainability development. These approaches included the multilateral organizations, which included the World Bank, the bilateral agencies of USAID, the US Federal Government agencies, namely the EPA, and the current developments of sustainability management of business organizations. These four approaches show that sustainability is rooted in evolutionary theories of industrial ecology and economic growth and development. Accordingly sustainability is rooted in the staged theory of economic growth and the trickle bottom down effects of industrial development. Sustainability accounting and reporting has been shaped by these ecological resources management policies of international bilateral and multilateral organizations as well as US Federal Government agencies that have environmental oversights over business industrial and manufacturing operational activities.

In accounting sustainability has formed the basic core assumptions of the triple bottom line (TBL) reporting (Aras and Crowther, 2008; Etzioni and Ferraro, 2007). TBL has incorporated sustainability by incorporating Global Reporting Initiative (GRI) three G's economic, environmental and social guidelines to assess the impact of business performance among all sectors/groups of the economy, including profitability and shareholder value creation and associated social, human and environmental resources management (GRI, 2008, 2009, 2010). Accordingly, TBL reports economic, environmental and social data to indicate levels of sustainability commitment along

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these three performance measures. Although TBL reports are not mandatory, they are prepared to meet external reporting requirements related to sustainability performances (Christofi *et al.*, 2007).

More recently, the passage of the Sarbanes-Oxley Act of 2002 (Environmental and Sustainability Reporting) broadened the scope of accounting reports to include sustainability programs, which has now been integrated by many organizations into part of their strategic planning processes (Fisher *et al.*, 2007). As a result, many business organizations prepare sustainability reports that account for their social and environmental performances (The Accounting for Sustainability Group, 2006). Public accounting firms have started providing consulting services to assist organizations in the design and implementation of sustainability reporting systems, which included sustainability awareness training to employees, performing limited scope audits requested by top management, conducting supply chain audits, organizing compliance audits, advising on the appointment of outside assessors and coordinating audit activities by external assessors (KPMG, 2010; Pricewaterhouse Coopers, 2010).

Most public accounting firms have issued guidelines on sustainability reporting in an attempt to promote consistency and comparability among business organizations sustainability reports (Wallage, 2000). For example, the American Institute of Certified Public Accountants (AICPA) has issued broad guidelines that define responsible and good corporate governance and sustainability fundamentals for improved business performance (AICPA, 2010). The declaration initiative has focussed on integrated social and environmental performances with financial reporting rather than issuing separate reports addressing social, environmental and economic issues. It has also advocated for an integrated oversight to review these reports, not necessarily mandatory requirements. The goal is to provide assurance on integrated reports, that is, external opinion validation that is comparable to the auditing of financial reports by Certified Public Accountant firms (Ernst & Young, 2010). If these suggestions and guidelines are accepted by many organizations, the trend will be on preparation of uniform sustainable reports that can provide comparative data by industries, sectors and competitive organizations.

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