

Mentoring of Women Engineers and Scientists for Sustainable Economic Development

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Abstract: *The World Commission on Environment and Development defined Sustainable development as 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs.' Strategy for achieving the goals of the SDGs are anchored on three pillars namely economic, environment and social. These sectors are very relevant to discussions of gender participation and equality. The three dimensions are interrelated and interwoven as strength or weakness of one assuredly affects the others. For instance backwardness in achieving sustainable economic development would easily precipitate social lapse and further impact negatively on the environment. The Sustainable Development Goals (SDGs) are intended to be universal in the sense of embodying a universally shared common global vision of progress towards a safe, just and sustainable space for all human beings to thrive on the planet. They reflect the moral principles that no-one and no country should be left behind, and that everyone and every country should be regarded as having a common responsibility for playing their part in delivering the global vision. In general terms, all of the goals have therefore been conceived as applying both as ambitions and as challenges to all countries. All of the goals and targets contain important messages and challenges for developed and developing countries alike. It is no gainsaying the obvious that women are the main stakeholders and drivers of development and that technology creates the infrastructure to enable the development and sustainability of peoples and things. Women engineers and scientists alongside their male counterparts hold the responsibility to provide the requisite technologies to achieve the SDGs. The fact of their gender affords them deeper knowledge and insight into the comfort and travails of the population needing economic sustainability and development. It can be suggested and indeed affirmed that women engineers and scientists have the greatest role to play to ensure sustainable economic development of their community and country at large. In the light of this, it becomes important to initiate a mentoring system or platform for women engineers and scientists so as to properly equip them to deliver the rare zeal, talent and professionalism that would drive sustainable economic development leading to the realization of environmental and social sustainability. This documents looks at gender issues with regard to economic development and discusses a platform to ensure the mentoring of women engineers and scientists to enable them succeed professionally and thereby impact positively on sustainable economic development of the Nigerian citizenry.*

Keywords: *Women, Engineers, Scientists, Mentoring, Development, Economic, Sustainable,*

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I. Introduction

Sustainable economic development is the challenge of meeting human needs for natural resources, industrial products, energy, food transportation, shelter and effective waste management while conserving and protecting the environment for future human and capital development when they are fully harnessed to create jobs and generate income for the government for the purpose of economic development and transformation of society to the glory of God (Okoye, 2010). Economic empowerment is the capacity of women and men to participate in, contribute to and benefit from growth processes in ways which recognize the value of their contributions, respect their dignity and make it possible to negotiate a fairer distribution of the benefits of growth. Economic empowerment increases women's access to economic resources and opportunities including jobs, financial services, property and other productive assets, skills development and market information (OECD, 2012). We all agree that progress in achieving sustainable development goals has been abysmally slow. In the 21st century, we are confronted with economic, environmental and social crises on a global scale. Advances in attaining gender equality have been equally sluggish. Is there a link between these two trends? (Candice Stevens, 2010).

Women's economic participation and empowerment are fundamental to strengthening women's rights and enabling women to have control over their lives and exert influence in society. It is about creating just and

equitable societies. Women often face discrimination and persistent gender inequalities, with some women experiencing multiple discrimination and exclusion because of factors such as ethnicity or caste. Former President Bill Clinton addressing the annual meeting of the Clinton Global Initiative in September 2009 stated that “Women perform 66 percent of the world’s work, and produce 50 percent of the food, yet earn only 10 percent of the income and own 1 percent of the property. Whether the issue is improving education in the developing world, or fighting global climate change, or addressing nearly any other challenge we face, empowering women is a critical part of the equation (OECD, 2012).

The environment does not exist as a sphere separate from human actions, ambitions, and needs and attempts to defend it in isolation from human concerns have given the very word “environment” a connotation of naivety in some political circles. The word “development” has also been narrowed by some into a very limited focus, along the lines of “what poor nations should do to become richer,” and thus again is automatically dismissed by many in the international arena as being a concern of specialists, of those involved in questions of “development assistance.” But the “environment” is where we live; and “development” is what we all do in attempting to improve our lot within that abode. The two are inseparable (Kates et al, 2005). Overall sustainability has been defined in many ways, and is often considered to have three distinct components: environmental sustainability, economic sustainability and social sustainability. These three factors when considered separately usually pull society in different directions (e.g., economic sustainability may be achieved at the expense of environmental and social sustainability). Overall sustainable development in general requires the simultaneous achievement of environmental, economic and social sustainability. Achieving this balance is indeed a challenging task (Rosen, 2012).

The issue of Sustainable Economic Development is a task that cannot be addressed without the participation of all. Women’s economic empowerment is a critical imperative for the business community and policymakers. In addition to contributing to stronger and more inclusive societies, there is a compelling economic case for engaging women in the workforce. Research has shown that increasing the participation of women in the economy will enhance growth in economies throughout the region. Empowering women to more fully participate in the economy can occur at a number of different levels ranging from measures to encourage entrepreneurship and work in local communities to policies and practices designed to increase opportunities in education, middle management and business leadership roles. A variety of challenges exist across the region, but taking steps to engage women in the workforce will not only create new economic opportunities, but will also ensure that existing talent can realize its full potential.

A study of the Department for International Development (DFID) titled “Agenda 2010-The turning point on poverty: background paper on gender”; explains that higher female earnings and bargaining power translate into greater investment in children’s education, health and nutrition, which leads to economic growth in the long term. It further states that in India for instance, GDP could rise by 8% if the female/male ratio of workers went up by 10%; and that total agricultural outputs in Africa could increase by up to 20% if women’s access to agricultural inputs was equal to men’s. But achieving women’s economic empowerment is not a “quick fix”. It will take sound public policies, a holistic approach and long-term commitment from all development actors. Women’s economic empowerment is both a right and “smart economics”. Development actors need to reach and enhance opportunities for the poorest of the poor and women in remote communities. “Picking winners” is not enough (OECD, 2012).

Economic development is the development of economic wealth of countries or regions for the well-being of their inhabitants. The economic development process supposes that the legal and institutional adjustments are made to give incentives for innovation and for investments so as to develop an efficient production and distribution for goods and services. Economic development is a sustainable increase in living standards that implies increased per capita income, better education and health as well as environmental protection. The achievement of sustainable economic development requires a new and different approach to policy making and its implementation (Okoye, 2010). The Government should seek greater integration and co-ordination of policy making and its implementation across the public sector and across social economic and environmental policy portfolios. It should also seek an approach characterized by greater partnership between central government, local government, economic entities, private industry and other community groups

Engineering and science uses resources to drive much if not most of the world’s economic activity, in virtually all economic sectors, e.g., industry, transportation, residential, commercial, etc. Also, resources used in engineering, whether fuels, minerals or water, are obtained from the environment, and wastes from engineering processes (production, transport, storage, utilization) are typically released to the environment. Finally, the services provided by engineering and science allow for good living standards, and often support social stability as well as cultural and social development (Rosen, 2012). Given the intimate ties between engineering and the key components of sustainable development, it is evident that the leading participation of engineers and scientists is a critical aspect of achieving sustainable economic development.

Engineers provide the bridge between science and society. In this role, engineers must actively promote and participate in multidisciplinary teams with other professionals, such as: ecologists, economists, medical doctors, and sociologists, to effectively address the issues and challenges of sustainable economic development because engineers working on a global scale will help promote public recognition of the engineers and understanding of the needs and opportunities in today's fast developing world in order to ensure the scientists' and engineers' role in a sustainable economic development in it. According to Numan A. (2020). Sustainability driven Scientists and Engineers can contribute to all the steps in the sustainable systems model by:

- i. Developing, processing and transporting natural resources in closed-loop systems, we can reduce waste and increase the efficient use of resources.
- ii. Harvesting renewable resources such as water, fish and trees within the limits allowed by nature so as to ensure a continuing supply of resources for humans and natural ecosystems.
- iii. Minimizing our use of non-renewable resources, such as petroleum and scarce minerals, and replacing them with environmentally friendly substitutes in order to extend the supply of natural resources.
- iv. Processing natural resources efficiently and with little or no waste helps to preserve the earth's finite natural resources. We can further preserve resources by designing products and packaging for reuse and recycling, and we can protect resources through industrial processes and facilities that have minimal adverse environmental impacts throughout their full life-cycles.
- v. Transporting goods contributes heavily to pollution; to minimize these effects, we can transport resources and manufactured goods efficiently to consumers by pipelines, rivers, railways, roads, ships and airplanes using technologies that have minimal impacts on the surrounding land use and serve the needs of consumers with little waste.
- vi. How we develop, process and transport resources can improve living standards in many ways. These include providing clean water, energy, housing and commercial buildings and streets and other forms of infrastructure; efficiently storing and distributing food; and meeting acceptable health standards, including high-quality waste management and treatment.
- vii. To allow natural and built environments to be clean and unpolluted, we can reduce waste throughout this ecosystem cycle by continually recycling and recovering residual byproducts of resource development, industrial processing and meeting consumer needs. Some waste in the system is inevitable but should be in forms that have minimal long-term impacts on the natural environment. The impacts from residual waste can be offset by continuing programs to clean up and reuse old waste sites, along with other forms of environmental restoration.
- viii. The effects of developing energy sources on the atmosphere, earth and water can be reduced by more efficient use of power and by production from non-fossil sources.

Engineers and scientists must lead this new industrial economic revolution. Indeed, Women Scientists and Engineers' if the goals of Sustainable Economic Development and indeed of the goals of the entire SDGs are to be achieved. The abysmal performance in economic and social growth of the nation has been seen to proceed partly from the low inclusion and poor empowerment of women; and the issue must be addressed for the stated goals to be achieved. While we continue to discuss with government and other stakeholders, the woman engineer or scientist must rise tall and take responsibility for the circumstance of gender and profession has given her the onerous task of championing the strategies for 'Sustainable Economic Development of our dear country, Nigeria. She is at the center of the universe by gender relating with all, having given birth to all of them and feeling their happiness and travails with her soul and professionally position as the bridge that creates and transports requisite technologies for solving prevailing problems leading to the sustainable economic development of the entire citizenry. It is the opinion of this study that the woman engineer and scientist need to be mentored professionally in order to prune her to excellent practice and that Mentoring of Women Engineers and Scientists is one big shot that would lead us to our target in ensuring sustainable economic development of the country.

II. Statement of the Problem

Across the world, poverty wears a woman's face. She battles daily with the greatest obstacles to her well-being and autonomy, struggling to meet her family's most basic needs against deep-rooted discrimination, exploitation and exclusion from the benefits of development. A daunting set of statistics reveals that 70% of the 1.3 billion people living in extreme poverty are women, who perform 66% of the world's work and produce half its food while earning only 10% of the world's income and owning less than 1% of its property. Despite these grim realities, women bring enormous energy, leadership and resilience to protecting families and rebuilding fractured communities. Yet, their essential voices remain absent from formal negotiations and policy making tables, meetings and conferences. With the needs of women on the margins of reconstruction, development and poverty reduction programmes sustainable economic development remains elusive.

In the contemporary Nigerian society, many women are facing daunting challenges of joblessness, no source of livelihood, widowhood, and single parenthood. These challenges notwithstanding, the roles played by women in national development and in all facets of human endeavors have been quite notable and inimical to the realization of sustainable economic development. In virtually all Nigerian societies and cultures, women who once functioned as girls, are not only mothers and wives, and thus also produce and nurse children. They are cook and house-workers. They do laundry works and general sanitation of residential quarters. They generally take control of the domestic domain but since there may not be “two captains in one ship,” women become marginalized (Aliyu, 2013). It is the earnest opinion of this study that these problems would be effectively addressed when women engineers and scientists are better equipped professionally through articulated mentoring and then enabled to marshal action strategies for the sustainable economic development of women specifically and that of the nation at large.

III. Research Methodology

The study involved an extensive literature review which critically analyzed the present status, problems and prospects of mentorship development as part of the roadmap to making the woman science and engineering graduate more active and equipped to solve the numerous socio-technological problems hindering sustainable economic development within his environment. The work relies on facts of action as evidenced in reports and literary items. It lays down some methods for fostering mentorship and suggests action which women engineers and scientists can take to enhance sustainable economic development of the country.

IV. Mentoring

Mentoring is not a new concept; it has its roots in ancient Greece. And throughout the millennia, mentoring-providing guidance and counsel to a younger individual—has occurred spontaneously as informal relationships: a supervisor at work who takes an interest in a young person’s upward mobility; a teacher who takes extra time with a struggling or promising student; an older family member who provides a shoulder to lean on when needed (MENTOR/National Mentoring Partnership, 2005). A mentor is an individual with expertise who can help develop the career of a mentee. A mentor often has two primary functions for the protégé. The career related function establishes the mentor as a coach who provides advice to enhance the mentee’s professional performance and development. The psychosocial function establishes the mentor as a role model and support system for the mentee. Both functions provide explicit and implicit lessons related to professional development as well as general work–life balance. For the purposes of this document, it is important to differentiate between the terms protégé and mentee. The term protégé has a clear history in mentoring research and primarily applies to individuals engaged in senior–mentor and junior–protégé relationships within an organization where protégés are clearly identified as “under the wing” of a mentor—protected and nurtured over time. The term mentee is used here to refer to the broad range of individuals who may be in the role of “learner” in mentoring relationships, regardless of the age or position of the mentor and mentee (Daniel et al, 2006). Generally the mentoring discussed here is one between a mentor and protégé.

Research has consistently found mentored individuals to be more satisfied and committed to their professions than non-mentored individuals. Furthermore, mentored individuals often earn higher performance evaluations, higher salaries, and faster career progress than non-mentored individuals. Mentors can also benefit from a successful mentoring relationship by deriving satisfaction from helping to develop the next generation of leaders, feeling rejuvenated in their own career development, learning how to use new technologies, or becoming aware of issues, methods, or perspectives that are important to their field (Daniel et al, 2006).

V. Recommendations

The production of more women graduates of engineering and science would greatly enhance the strength of women in the society and strategically position them to singly or in concert with other professionals be able to influence policies and laws that would foster sustainable economic development from the angle of women empowerment in the country. Practicing women engineers and scientists would be aided by older engineers and scientists to enhance their professional practice through installing “Mentorship System” for women in science and engineering practice in the country. Where necessary they can leverage on the sound relationship it has with the Council for the Regulation of Engineering (COREN) and the Federal Ministry of Science, Technology and Innovation (FMST&I) to infuse a mentoring system into the practice of engineering and science in Nigeria. The programme of action shall be double pronged as follows:

i. Catch them Young Programme

It is advised that women engineers and scientists arrange sensitization, awareness and promotion programmes aimed at encouraging girls in secondary schools to get interested in the sciences and mathematics and seek admission into engineering courses of their choice in the universities and other higher institutions.

ii. Mentoring Women Graduate Scientists and Engineers

a. Presently the practice in government agencies and companies is that each engineer or scientists works under a professional superior. Improved relationship between the juniors and their superiors will go a long to foster mentoring. The habit of mentorship reporting shall be encouraged as novel innovations and inventions can easily be generated when the Mentorship Programme is seriously promoted.

b. All women science and engineering graduates serving under the National Youth Service Corps (NYSC) programme are to be attached to relevant scientists and engineers (even outside their working places), to work on feasibility report and business plan on innovative ideas based on their areas of personal interest or researches undertaken while at school; as presently done at the National Board for Technology Incubation (NBTI). This can enable them to take off Start-ups that can turn them into future Company owners and employers of labour.

VI. Conclusion

It is clear that achievement of full human potential and of sustainable development in the country would be difficult if women scientists and engineers and who are professionally equipped to deliver technology do not stand up and take the bull by the horn. Mentoring is assuredly a good method of enhancing expertise. The study proposes a two pronged action to ensure the production of more women scientists and engineers to beef up capacity as well as enhancing the mentoring of women scientists and engineers for excellent professional practice. It is hoped that if the recommendations are applied, the dream of sustainable economic development for Nigeria and its citizenry would be realized within a very short time.

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