# Incorporating Science and Technology in Higher Education into Strategic Planning for Sustainable Development in Somaliland

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**Abstract**

Education for Sustainable Development (ESD) is the educational process of achieving human resources with capacities to contribute to the development endeavors of a particular country based on its own priorities. National and international indicators illustrate that there is a big insufficiency in science and technology (S&T) in higher education (HE) in Somaliland/Somalia as compared to other countries in the developing world. This important problem has an effect on the HE institutions' capacity to deliver S&T programs with the required standards. This problem does not only affect the HEIs but also restricts the young students' creativity, technical skills and other competencies required in the contemporary world as well as Somaliland development priorities. The problems in S&T with HEIs will block creative and critical thinking, employability, curiosity and positive attitudes of fresh graduates towards contributing to national development. In order to evaluate S&T competencies and capacities of HEIs, this paper uses both input-output S&T indicators. This paper also determines if universities have policies and strategies designated to enhance S&T capacities to ensure improved quality of the S&T programs offered. A questionnaire with 10 items about S&T indicators has been prepared and applied to 6 universities in two different cities (Borama and Hargeisa) of Somaliland. Other literature reviews related to this matter were also reviewed and quoted. According to the result of this research, the main problems with S&T education are of two folds. Firstly, the universities studied do not have S&T strategies and plans, which are supposed to guide and enhance institutional capacities and competencies in S&T provisions in teaching and learning. Secondly, the universities studied also have an insufficient number of S&T lecturers and other facilities/infrastructures and this is the main reason that HEIs' scientific research output towards sustainable development in Somaliland is totally lacking. As result of this, almost all universities in Somaliland do not offer S&T programs at all levels and those offer these programs do not have sufficient capacity to deliver programs to the expected standards.

*Keywords:* S&T; Education for Sustainable Development; Policies and Strategies.

## ■ 1.0 INTRODUCTION

Science and Technology (S&T) are integral part and the most crucial enablers to Sustainable Development (SD) as was affirmed by at the World Summit on Sustainable Development (WSSD) in 2002. At one of its major parallel events, the S&T forum on SD, the conclusions of which were ALSO reflected in the Johannesburg Plan of Implementation (JPOI). In this plan, the participating governments acknowledged the essential role of S&T in generating solutions to environmental and developmental issues. Most notably, the document stressed the importance of enhancing development and transfer of S&T to the developing countries. Enhancing and building up S&T capacities of HEIs in relation to R&D provisions tailed with national economic growth needs the collaboration of various institutions such as; cooperatives, professional bodies including centers of excellence are the way forward to sustainability (Yukiko Fukasaku, 2007).

S&T can also play vital roles in easing implementation of the goals of education, gender, health and SD (Zamhari, 2013). The WSSD declared the significance of S&T, but the scientific, engineering, and technology communities have yet to be fully incorporated into a system that encourages and enables improvement in economic

development (Allotey, 2007). Very competent engineering organizations and expertise are available to address acute problems, such as natural or other disasters. Ability to put these resources to use for long-term on SD in developing countries like (Somaliland) is lacking (Juma, 2007).

S&T knowledge transfer issues which received considerable attention from all HEIs' stakeholders. Economic growth and social well being are heavily dependent and desperately rely on S&T capacities and provisions of HEIs. Technological innovation, dissemination, and adaptation are essential element of any Sustainable Development Goals (SDGs). Business and industry are a primary source of innovation and provide optimum benefits when short- and long-term enabling frameworks (Willie O. Siyanbola, 2011). Furthermore, economic improvements; including social development are transformed by S&T through creating young entrepreneurs so as to boost up youth employability (ILO, 2016).

Developed countries achieved much in economic growth and diversification through heavily investing in S&T capacities in their universities and the research institutions. As such, the development process requires the appropriate application of sound scientific and technological innovation led by skilled human resources. This is a fact acknowledged by the most developed nations in the world. Knowledge and the innovation-based economy did not come without S&T been the driver and engine for SD, but through understanding the importance of STEM in education that has been build up for decades (Clarence Dancer, 2014).

Hence, there is a need to cultivate a culture within Somaliland context, which the advancement of S&T knowledge is valued, considered an important component of national development. HEIs must be encouraged to upgrade their capacities and competencies in S&T provisions for them to contribute to regional, national and global SDGs. Efforts must also be made to establish efficient, integrated and complementary mechanisms, by which individual stakeholders, governments and industrial entities and may interact creatively and form collaborative partnerships, to their own benefit, and for the region at large (Filomena, 2015).

In the context of Somaliland, five major national priorities were set as its SNDP in 15 years. These goals with their sub-targets are not incorporated with S&T capacities which without them any development agenda will not go well and be accomplished. Thus, any regional development policy must give focus to key productive sectors, including agriculture, manufacturing and heavy industry. The service-oriented sectors of health, education, energy and communication, and the issues of exploitation of our natural resources and protection of the environment must also be addressed within the national development (Beverly J.T. Taylor, 2017). Therefore, for Somaliland to achieve the national priorities set, there must be context based and integrated framework that addresses HEIs as key contributors through R&D and S&T transfer (Madar, 2016).

## ■ 2.0 THIS STUDY

This study intends to determine S&T status or capacities and the reasons of very low S&T capacities of HEIs in Somaliland. It has been prepared a questionnaire with 10 items of about S&T assessment in HEIs. The participants of the present study were 251 lecturers at 6 HEIs in Somaliland that offer S&T related programmes. Likert five scales are used to assess and identify the S&T and R&D gaps within the selected HEIs. This type of scale enables the researcher measure the intensity or degree of agreement or disagreement of the respondent to statements made on S&T, RD, and HEIs for SD endeavors. With Likert Scale, it is possible to compare responses among respondents using statistical methods and another matrix such as chi-square analysis. The indicators used in this study were adapted from prior research on S&T in HEIs. Disruptive statistics were used to analyze data and percentage was used to determine the S&T capacities of HEIs.

In order to measure and evaluate capacities of HEIs, three indicators which are based on the functions of HEIs are adapted including R&D and S&T and are considered as key functions that all HEIs should possess. These capacities are considered to be key contributors in HEIs to the development at all levels. These indicators were divided into sub-indicators which are measurable as illustrated in the following table 1.

**Table 1:** S&T input-output indicators

| RESEARCH AND DEVELOPMENT | |
|---|---|
| **INPUT INDICATORS** | **OUTPUT INDICATORS** |
| Research Grants Received | Patent Publications |
| Budget Allocation | R&D financing |
| Sponsorship | Active R&D human capital |
| Facilities and infrastructure | Contributions |
| Research Culture among Staff | Beneficiary |
| Staff Qualification | Supervision |
| Number of Staff working in R&D | Research Fellow/Number Ph.D. students |
| **SCIENCE AND TECHNOLOGY** | |
| **INPUT INDICATORS** | **OUTPUT INDICATORS** |
| S&T facilities | S&T patents |
| Staff Qualifications | Value creation |
| S&T investment | S&T consultancy |
| S&T strategies | S&T training programs |

The above indicators were transformed into two main indicators that encompass of the sub-indicators that are supposed to measure capacities of HEIs in S&T and R&D. Though the indicators adapted are universal indicators for evaluating S&T provisions both as national and institutional levels (Nour, 2012). However, the indicators have been modified to suit with the context of Somaliland HEIs.

■ **3.0 RATIONALE OF STUDY**

Advancement of S&T enables HEIs to deliver high-quality education with international standards (Rauf, 2012). As S&T are the most two important pillars of institutional sustainability and development, however, HEIs are not also exceptional (Özden, 2007b). Applications and integration of S&T into education, promotes quality of programs offered, which are needed by business sectors, government institutions, marketplaces and also equip graduates with relevant knowledge and skills in S&T that reflects the holistic development sectors of the national economic growth (Kakar, 2006).

Additionally, HEIs play a key role in S&T acquisition and transfer which may enable the development different sectors of the economy growth. In the context of Somaliland, just like any other country, the roles of S&T provisions are also very instrumental and substantial on inclusive development. At present, S&T have been proposed as key enablers or factors towards achieving development goals. As such, this study is borne to investigate HEIs capacities in S&T in relation to Somaliland Sustainable Development Goals (SSDGs). The heart of S&T capacities in HEIs are staff qualification, techno-infrastructure and scientific patents. However, this research looks into broad measures of S&T knowledge, which is crucial in knowledge transfer within HEIs, including factors that hinder S&T capacities of HEIs so as to contribute to the national development (Isabelle, 2014). Therefore, the study presented the assessment of findings related to S&T capacity, both input and output indicators. In order to simplify the internal technology transfer measures of HEIs. The study will determine the extent to which the HEIs' initiatives have been successful in transferring S&T knowledge domestically. As such, S&T development projects/programs, facilities, labs, patents, S&T investment, staff qualification on S&T are determined and assessed. Finally, factors and gaps that hinder S&T provisions in HEIs are evaluated.

This study showed status of S&T capacities of HEIs for SNDGs. It is clear that Somaliland lags behind the world's developed and developing countries in terms of the same input and output indicators. Together with poor S&T input/resources along with inadequate economic systems as whole results in HEIs lack S&T capacities and competencies. Moreover, this research paper finds that most R&D activities in HEIs are very poor or totally absent and almost all educational institutions are solely teaching as their main functions.

The findings are presented in details; descriptive analysis such as percentages and Chi-Squire test is to show the current status of S&T of HEIs in Somaliland. The following table 2 presents S&T capacities in HEIs institutions.

**Table 2:** Science & Technology Status at HEIs

| Ratings on Science and Technology | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Valid** | **Very Basic** | **Basic** | **Fair** | **High** | **Very High** | **NR** | **Total** |
| Count | 196 | 3 | 0 | 0 | 0 | 16 | 215 |
| Percentage | 91.2 | 1.4 | 0.0 | 0.0 | 0.0 | 7.4 | 100.00 |
| Broad Count | | 199 | 0 | | 0 | 16 | 215 |
| **Broad Percentage** | **92.6** | **0.0** | | | **0.0** | **7.4** | **100.00** |

With respect to the above results presented on S&T ratings of universities surveyed shows that a very high majority (91.2%) of HEIs in Somaliland have very basic S&T capacities while only 1.4% of them have basic capacities in S&T. On the other hand, the broad count shows that 92.6% of HEIs S&T is considered to be basic and there is no any category between very basic and basic. This result suggests that HEIs of Somaliland does not have sufficient capacity to contribute to the national development since their capacities and competencies in S&T are very basic and much below the universal standards.

The data presented in Table 2 was tested using Chi-Squire test for goodness of fit to determine whether the results presented are significant. Therefore, S&T in HEIs are very basic and as such, it can be concluded that; HEIs of Somaliland does not have the S&T capacity to transfer and to create value chain in economic development. The results of Chi-Squire test have summarized the table below. The following Chi-Squire uses the broad count on S&T ratings.

**Table 3:** Chi-Squire Test on S&T

| Variable | N | df | $X^2$ | Asymp. Sig (P) | Decision |
|---|---|---|---|---|---|
| S&T Rating | 215 | 1 | 187.181 | .000 | S&T is not |

*Note: $X^2$ (0.05, 1) = .3.841: a. 0 cells (0.0%) have expected frequencies less than 5.*
*The minimum expected cell frequency is 95.0.*

The data in table 3 is a summary of Chi-Square result shows that S&T provisions and capacities of HEIs institutions are not significant and insufficient to contribute to SSDGs. It shows that X2 (N=215) = 187.181 where P = 0.00. This shows that there is no a significant difference in the rating of HEIs on S&T. Based on the data presented, S&T capacities of HEIs are considered insignificant and very basic or almost absent. As such, HEIs' contributions to national development is not significant and instrumental due to the facts that lack capacity in S&T knowledge and skills that would boost/improve to nation's economic development in terms of knowledge transfer by creating value to potential resources available. Hence, the assumption that in HEIs has S&T capacities to contribute to development is not significant. This means that HEIs investigated do not have sufficient S&T facilities including labs, technology aided learning and there is no high tech-skilled human capital deployed at HEIs.

Furthermore, almost all HEIs in Somaliland do not put S&T training professional development programs in place to ensure that S&T are integrated into teaching and learning. HEIs in Somaliland do not have qualified staff with high tech-skills, government institutions do not give grants to upgrade HEIs, insufficient S&T facilities and most programs offered by HEIs in Somaliland are non-S&T which are not yet tailed with country's potentiality.

The second issue under staff capacities of HEIs in Somaliland was R&D provisions. R&D was measured for (research conduct or participation, publications/scientific patents, books, papers, journals, editing of books and papers or articles, research grants secured, research sponsorship obtained and supervision of student research works. The staffs were assessed on the extent to which they publish, supervise, undertake research projects, review/proofread research publication, secure research grand, and avail research sponsorship. The results are summarized in table 4.

**Table 4:** Research and Development Status of HEIs

| Rating on R&D | | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Very low** | **Low** | **Fair** | **High** | **Very high** | **NR** | **Total** |
| **Count** | 132 | 2 | 0 | 0 | 0 | 17 | 151 |
| **Percentage** | 87% | 1.3 | 0.0 | 0.0 | 0.0 | 11.3 | 100.00 |
| **Broad Count** | | 134 | 0 | | 0 | 17 | 151 |
| **Broad Percentage** | 88.7 | 0.0 | | | 0.0 | 11.3 | 100.00 |

Table 4 presents the rating of staff in HEIs in Somaliland on R&D. It is based on contributions of university staff to national development through capacities of R&D. The table shows that very high majorities (87.4%) of the staff in HEIs in Somaliland have very low contributions to R&D and 1.3% has low contribution to R&D. On the broad count, a majority (88.7%) of staff has low contributions to R&D and no staff (0.0%) has the fair and above contribution to R&D in Somaliland. This suggests that the staff of HEIs in Somaliland generally have very low or no contributions to R&D at all. The data presented in table 5 was tested using Chi-Squire test for goodness of fit to determine if there are significant determinants in the results presented. As result of this, any assumptions that suggest HEIs have significant contributions to R&D towards national development are not accepted.

**Table 5:** The result of Chi-Squire

| Variable | N | df | $X^2$ | Asymp. Sig (P) | Decision | |
|---|---|---|---|---|---|---|
| R&D Rating | 151 | 1 | 128.119 | .000 | R&D | not |

*Note: $X^2$ (0.05, 1) = .3.841: a. 0 cells (0.0%) have expected frequencies less than .05.*
*The minimum expected cell frequency is 67.0.*

The data in table 5 is a summary of Chi-Square results of the staff on rating R&D. It show that $X^2$ (N=215) = 128.119 where P = 0.00. It shows that the assumption indicating that there is the significant difference between staff with low and high on R&D was rejected. The above table shows that the calculated Chi-Squire value is at the critical level as it indicates 67.0 with .05 as the level of significance. The result concludes that R&D in HEIs indices is not significantly considered as contributing factor to SNDGs.

### ■ 5.0 CONCLUSION

This paper shows the status of S&T in HEIs in Somaliland. It is clear that Somaliland HEIs lag behind the world's standards in terms of the same indicators. The combination of very low S&T capacities and limited

economic resources are the current challenges that hindered HEIs' contributions to Somaliland National Development Goals (SNDGs). The findings indicate so far Somaliland HEIs do not possess the entire human and financial capital essential to promote S&T. Similarly, the findings show that the main problems hindering R&D provisions of HEIs are lack of finance, facilities and qualified manpower (researchers and experts) who are active in R&D fields. The results of the analysis strongly suggest the HEIs need to improving both R&D and S&T capacities and learning from other more advanced universities in the region. Our results conclude that the main suggestions to improve R&D including the availability of adequate budget from the public sector, the private sector and making available qualified human resources. Hence, the analysis indicates that in order to improve S&T capacities, Somaliland needs to support HEIs both financially and human resources

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