

# Education on Renewable Energy in Secondary Schools

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Education is key to advancing a society that can achieve the Sustainable Development Goals (SDGs). One SDG is shifting energy consumption from fossil fuels to renewable energy (RE) sources to reduce environmental damage and prevent global warming. Awareness must be instilled among citizens at an early age (as early as secondary school) to motivate students to pursue higher education and careers in RE concepts and technologies.

secondary school education

renewable energy

awareness

## 1. Introduction

Investment in the renewable energy (RE) sector is a fundamental part of achieving the Sustainable Development Goals (SDGs), a collection of 17 interlinked global goals for achieving a better and more sustainable future for all, that were adopted by all member nations of the United Nations (UN) in 2015. However, a noticeable decrease was observed recently in the global investment in RE infrastructure. A 3% decrease was recorded in the global investment in RE technologies and infrastructure in 2017 [1]. This percentage might have increased in the last 2 years (during the COVID-19 pandemic), which presents a great concern for achieving the global SDGs. To cope with the economic effect of the pandemic, especially the disruption of the supply chain in the RE sector, most countries are relying on fossil fuels to manage their energy demands and revamp their economies. Furthermore, the global investments and government incentives toward developing the RE sectors have declined to cope with the economic effect of the pandemic, which may severely impact the global SDGs [2]. A survey by the Solar Energy Industries Association (SEIA) revealed that 55% of the workers in the sector have been dismissed or are suffering from the effect of the pandemic. The survey also revealed other pandemic-related issues, such as delays in supplying equipment, construction and supply-chain delays, and insufficiency in the workforce, in the solar energy sector [3].

Furthermore, there was a decrease in effort from many different countries in creating awareness and promoting education for RE and SDGs. Education is a fundamental tool to help society achieve the SDGs; implementing RE education in various levels of education, such as secondary school, colleges and universities, will have a positive impact on the society [4].

## 2. Issues and Factors Related to Education for RE

The pandemic acted as a catalyst to expose the existing flaws in the infrastructure of the SDGs. One such flaw is the lack of RE-targeted education/courses at the secondary level. The lack of education in RE fields and technologies in secondary education (age 11–18 years old) accounts for the negative dissemination of RE technologies, design, and concepts, particularly among common people [4]. Different factors, such as socio-cultural, institutional, and technological barriers, persist among the public, owing to the poor dissemination of RE technologies education. Another barrier is the lack of creative methods for harnessing other RE sources and the high cost of harnessing the existing ones via available technology for the common people. Moreover, some of the existing technologies cannot satisfy the total energy needs of the public; thus, they are not cost effective either [5]. To overcome the barriers, new and creative technological advancements must be explored to harness energy from new sources by employing cost-effective technologies, thereby contributing significantly to meeting global energy needs. One strategy for meeting this objective is the introduction of RE concepts in the education spectrum from secondary school so that many future holistic citizens are informed of the grave necessity of RE technologies to motivate them to devise new creative and technological innovations in this field.

### 3. Impact of Secondary Education on RE

The subjects taught in secondary schools directly influence students' interest in particular courses at their tertiary and higher education levels. Previous studies in the field of education revealed that teaching secondary-level subjects in a structured, detailed, and interactive manner can enhance the students' interest in pursuing related fields. Students pursue particular courses in their higher studies based on their level of interest in that subject, as well as their anticipated success in the fields [6][7]. The availability of science, technology, engineering, and mathematics (STEM) subjects in secondary schools increases students' interest in STEM-based careers because of their early exposure to the basic knowledge, limitations or gaps, future implications, and career opportunities associated with the subjects [8]. The structuring of secondary school subjects or curricula with enhanced classroom experiences, detailed learning materials, and instruction methods, as well as interactive contents (projects, activities, etc.), directly contributes to inspiring students into pursuing STEM subjects at higher levels [9]. Most career paths at higher education levels are influenced by many different factors, including family background, family income, socioeconomic factors, and role models [9], although the availability of relevant subjects in secondary schools (ensuring the early exposure of students to the relevance, prospects, and implications of the subject in the global scenario) is also pivotal in encouraging students' pursuit of the subject at tertiary or higher education levels, thereby ultimately adopting it as a successful career path [10][11]. Thus, to ensure that future students develop interests in the RE sector, pursue STEM career paths, and opt to acquire knowledge and experience in RE technologies, they must be exposed to RE education from at least the secondary level education. With such an increase in the interests of future students in RE and STEM fields, more of them might pursue related career paths, and this would promote creativity and produce more skilled individuals in the sector to create, develop, maintain, and innovate RE technologies for their respective societies.

### 4. Public Awareness Regarding RE Technologies and Concept

Public awareness represents the level of understanding of the general public regarding the implication, relevance, and necessity of a certain subject, topic, or activity. Public awareness has played a significant role in the achievement of most major goals of society. Similarly, public awareness can be key to achieving the Renewable Energy goals. Many countries have implemented different policies, such as developing sustainable energy infrastructure, to enable them to generate a percentage of their energy needs from RE sources; however, they failed to achieve their targets for various reasons, including people's lack of awareness regarding RE (this factor prevailed) [12][13]. The global implementation of RE technologies is significantly hampered by "economic barriers" (where there is no investment in the infrastructure of RE technology) and "social barriers," which comprise the lack of awareness, information, as well as technological literacy among people [13]. This lack of awareness regarding the concepts and benefits (financial and ecological) of implementing RE creates uncertainties and an information gap for the public. The social barriers to RE technologies exert significant negative effects on the realization of a nation's SDGs and cause a dearth of active participants in the sustainability projects and policies of such a nation [14]. Another adverse effect of the lack of awareness and information is the unavailability of a professional workforce in the RE sectors. Furthermore, the lack of early RE-centered education creates an awareness gap among the people, as well as a lack of motivation and knowledge among students and the prospective workforce. Consequently, prospective students fail to acquire technical knowledge on RE concepts, thus causing a shortage in the skilled workforce of a nation that can develop, innovate, and operate different RE and sustainable projects and infrastructure. The lack of awareness and early exposure to RE concepts at the secondary level of education directly influences the level of future competent technical professionals that a nation will produce, as well as how well a nation can develop and build sustainable energy infrastructure to harness their energy needs and achieve their RE targets. Another barrier that is closely linked to the social barrier is the technological one, which causes the shortage of new research and technological advancements and innovations in the RE sector [5][15][16][17][18].

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