

# Developing a Greening TVET Framework

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## 1. Introduction

The Brundtland Commission (1987)<sup>1</sup> described sustainable development (SD) as a pattern of using resources in a manner that *“meets the needs of the present without compromising the ability of future generations to meet their own needs.”*

The escalation of industrial and agricultural production and high consumption levels have resulted in massive degradation of the resources both in terms of quantity and quality that exhausted the carrying capacity of these resources. Upon this recognition, the world now seeks to achieve sustainable development in realistic manner, early enough before all resources run out, environmental implications take their toll on life and achievement of quality life becomes unmanageable. Significant interactions among the dimensions of sustainable development--- economic, social and environmental, are important to be recognized to reinforce the interdependence that exists between them.

A holistic approach to sustainable development has always been emphasized but always come short to be realized. In spite of this, Education for Sustainable Development has permeated in the agenda of many countries since the UN Education for All (EFA) and the UN Decade of Education for Sustainable Development (ESD) have been set as international agenda. The development of skills to support this realization has similarly generated high interest from many players.

Technical and Vocational Education and Training (TVET) is one of those avenues to achieve the objectives of ESD. In 2004, the Bonn Declaration on Learning for Work, Citizenship and Sustainability<sup>2</sup> became instrumental in defining the role of TVET to sustainable development, stating that:

*“Since education is considered the key to effective development strategies, technical and vocational education and training (TVET) must be the master key that can alleviate poverty, promote peace, conserve the environment, improve the quality of life for all and help achieve sustainable development.”*

It further emphasized that:

*“Preparation for work should equip people with the knowledge, competencies, skills, values and attitudes to become productive and responsible citizens who appreciate the dignity of work and contribute to sustainable societies.”*

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<sup>1</sup> World Commission on Environment Development. (1987). *Our Common Future: Report of the World Commission on Environment and Development*. Published as Annex to the UN General Assembly document A/43/427. (Oxford University Press. 1987).

<sup>2</sup> UNESCO-UNEVOC (2004). The Bonn Declaration on Learning for Work, Citizenship and Sustainability. [http://www.unevoc.unesco.org/fileadmin/user\\_upload/pubs//SD\\_BonnDeclaration\\_e.pdf](http://www.unevoc.unesco.org/fileadmin/user_upload/pubs//SD_BonnDeclaration_e.pdf)

Several attempts had been made to elaborate the meaning of sustainable development and its relevance to education and training. These include initiatives that were carried out as part of the international agenda of multilateral stakeholders in TVET including the UN and its specialized agencies, like the UNESCO, ILO, as well as CPSC and others.

This paper seeks to examine the cornerstones of sustainable development in education and training, the vital link of technical and vocational education and training (TVET) with sustainable development, as well as the multiple debates and considerations available to achieve sustainable development in the context of TVET reforms. Within the context of strategies and concepts laid out for skills formation for green development by UNESCO, the green skills and green jobs under study by the ILO and some significant country-level and institutional level initiatives, the paper seeks to integrate in a more holistic approach a concrete framework that would set out an effective solution to implementing TVET in line with the achievements of sustainable development. The framework is intended to be beyond any one organization's thrust, or one country's socio-economic agenda. Towards this end, the paper seeks to elaborate a three-tier approach, consisting of 1) development of a framework to transform and orient TVET institutions into becoming 'green', 2) support transformation through a national-level Green Policy; and 3) develop an international cooperation model that support formation of a network of green-bound institutions.

## **2. Corner Stones of SD in Education and Training**

The earth summit (UNCED) conference that took place in Rio de Janeiro in 1992 had, as the centerpiece of Rio agreements (Agenda 21), a major action program towards achieving Sustainable Development in the 21<sup>st</sup> century. One of the important outcomes of the conference was reaching a consensus to incorporate environment and development education as an essential part of learning within the formal and informal education. Since then, governments have been called upon to strive to update or prepare strategies for integrating environment and development as a cross-cutting issue into education at all levels in the next three years (Agenda 21, Chapter 36). The conference hit a landmark success in encouraging countries to give importance to sustainable development paradigm and inject the concept into educational curricula at all levels.

By 2002, the World Summit on Sustainable Development followed. It resulted in the establishment of a special framework called the United Nations Decade of Education for Sustainable Development (UN DESD) from 2005-2014 that aims to *make sustainable development central to all education and training in all sectors by refining and promoting the transition to a sustainable future through all forms of education, public awareness and training*. In 2009, a comprehensive review of progress was undertaken.

From these, it is assumed that the role of education and training in achieving sustainable development has been broadly defined from inception and is in constant review up to this time. In fact, the Mid-Term draft review report on Decade of Education for Sustainable Development in 2009 identified 10 critical areas of concerns as priority if efforts have to be fast-tracked. These areas include awareness, meaning and scope of ESD, re-orienting curricula, teaching and learning, capacity-building, ESD-related research, monitoring and evaluation, ESD synergy with other 'adjectival' educations, ESD resources and materials, international and regional cooperation, national networking, coordination and financing<sup>3</sup>.

Based on these, reorienting curricula and teaching and learning are considered priorities to equip future generations with the right skills, knowledge and attitude that shape understanding and decisions for sustainable future. Education and training provides an enabling environment to

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<sup>3</sup> Majumdar, S. (2009). *Major Challenges in Integrating Sustainable Development in TVET*. Paper presented in the UNESCO-UNEVOC/CPSC/INWENT International Experts Meeting on "Reorienting TVET Policy Towards Education for Sustainable Development" Berlin, Germany.

learn and re-learn habit-forming practices and capitalize on knowledge and skills to create, maintain and achieve a sustainable future. As stated by this author (Majumdar, 2009), moving towards the goal of sustainable development requires fundamental changes in human attitudes and behavior in personal lives, community activities and the work place. It was also emphasized that, *“the shift towards a green economy requires education for sustainable development. Indeed, building green economies and sustainable societies requires more than clean technologies. Humankind will not solve the problems it faces today with the same values and approaches that created them.”*<sup>4</sup>

As TVET is the major producer of the workforce that are consequently absorbed in the industries, TVET is responsible for developing a significant number of workforce for creating, re-creating and transforming resources, often with environmental implications. When re-oriented towards sustainable development, TVET not only affords scientific and technical skills, but also facilitates understanding, motivation and support to apply them to create a sustainable future.

Sustainable practices have become a discourse in TVET and general education landscape, since they are held important to be transferred through basic, secondary and higher skills training, professional development and in-service skills training and upgrade.

### **3. TVET and the Changing Occupation**

Re-structuring of progress in many Asian countries like China, Korea and Singapore saw huge potential of social and economic activities in the green economy. New jobs are being created in areas of energy, water management, transportation, resource production, environmental conservation and the like. Green economy has substantially expanded in Europe based on activities on energy generation, environmental management and resource utilization. Globally, about 2.3 million jobs have been created in the recent years in the renewable energy sector. About 12 million jobs in high income economies are available in the recycling industries.

As such, the changing nature of the world of work, characterized by the shifts to green economies extends the scope of responsibility of TVET. Meeting the skills demand of the green economy also changes TVET's current priorities.

The concept of transition into a low-carbon economy has reinforced mitigation and adaptation practices of industries. It has also changed consumption patterns. Large-scale technological transitions are now being induced and new production techniques are introduced. With new and modified technologies, new operational skills requirements are demanded and new employment patterns are projected.

Drawn from these developments, TVET is faced with exquisitely expanding requirements. According to new employment trends, formal, non-formal or informal training must reflect these trends to train the workers with new and emerging operating techniques and technologies, raise their skills performance and prepare them for lifelong learning. Broadening the debate in raising skills, revisiting qualification targets, encouraging institutional reforms and increasing industry participation are few of the restructuring agenda of TVET. Green economy stimulates these efforts to be closely linked with environmentally-sound practices.

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<sup>4</sup> [http://www.unevoc.unesco.org/fileadmin/user\\_upload/pubs/SD\\_DiscussionPaper\\_e.pdf](http://www.unevoc.unesco.org/fileadmin/user_upload/pubs/SD_DiscussionPaper_e.pdf)

#### 4. Aligning TVET with green society and economy

Green economies and green jobs have launched foundation frameworks for international and multilateral organizations to align the purpose and objectives of education and training interventions in the 21st century. The ILO adopted a framework that emphasized skills development in being crucial to stimulating sustainable development since it raises enterprise productivity and employability<sup>5</sup>.

The US National Center for O\*NET Development<sup>6</sup> describes green economy as those economic undertakings linked with reducing the use of fossil fuels, decreasing pollution and greenhouse gas emissions, increasing the efficiency of energy usage, recycling materials, and developing and adopting renewable sources of energy. It describes a broad spectrum of work within the green economy, clustered into green sectors, each with respective occupational areas. The changing nature of work, the impact of technologies and new occupational demands are within this framework.

For TVET to be engaged and carefully aligned with the changing landscape, analysing and understanding the occupational landscape and changes brought by green economic activities would be useful.

A research study by the US National Center for O\*NET<sup>7</sup> classify occupations in the context of green economic activities and technologies. The main classifications are (1) **Green Increased Demand Occupations** (GIDO), the increase in the employment demand for an existing occupation due to green economic activities and technologies; (2) **Green Enhanced Skills Occupation** (GESO), the shift in the work and worker requirements of an existing occupation (i.e. skills, knowledge, tasks, credentials) with same purpose of the occupation due to green economic activities and technologies; and (3) **Green New and Emerging Occupations** (GNEO), the creation of new work or occupation and work requirements that may be born out of occupations that already exist.

An example of the shift in occupational requirements can be traced from industrial engineering occupation, which not only demonstrates the transition from 'white job', to 'blue job' but also extends to the creation of 'green jobs.' Note the emergence of at least two new work areas or occupations in industrial manufacturing sector that adopt environmental criteria:

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<sup>5</sup> European Centre for the Development of Vocational Training (2009)

<sup>6</sup> <http://www.onetcenter.org/green.html?p=3>

<sup>7</sup> The impact of green economy activities and technologies is rapidly changing the world of work by affecting worker requirements and occupational demand Accessed from <http://www.onetcenter.org/green.html?p=2>



The first two classifications GIDO and GESO are closely linked with mitigation-oriented occupations that already exist but need to be filled up in greater quantity or adjusted in the context of skills and competency requirements. The third classification, on the other hand, may be correlated with adaptation-oriented jobs and occupations that set new trends in creating new occupations that can specifically arrest the impact of global warming.

A sample list of skills projected across many sectors in the context of the green economy would provide a visioning structure for TVET, as presented below.

Table 1. Future Skills

Carbon capture and storage	technically more complex operations will involve workers with a very different skill set
Buildings	<ul style="list-style-type: none"> <li>• due to energy-efficient equipment higher-skilled, higher paying employment;</li> <li>• jobs are likely to be performed by workers who already work in the building sector. However, they will be redefined in terms of new skills, training and certification requirements;</li> <li>• potential for highly skilled researchers and engineers. Extensive training needs in three main areas: diagnostic techniques, knowledge of renewable energy, installation, organizational skills (i.e. town planning).</li> </ul>
Cement	jobs are expected to require higher levels of skills.0
Wind power industry (renewable)	<ul style="list-style-type: none"> <li>• many positions will require highly-skilled people;</li> <li>• universities need to consider offering entirely new study fields and majors due to technology development.</li> </ul>
Climate change	climate information and forecasting, research and development into crops adapted to new weather patterns could create specialized and high-skilled employment.
Agriculture	<ul style="list-style-type: none"> <li>• jobs for agricultural skilled workers, clerks and craft and related trades workers will decrease;</li> <li>• requirement for skilled agricultural and fishery workers about 2.2 million in 2015</li> </ul>
Electricity	probable that, together with technical competences, management skills will be required.
Rail sector	a dangerous shortage of skilled workers is emerging. This shortage might take place by 2030.
Waste treatment and recovery/recycling	rapid technological changes are increasing the demand for new skills.

Source: ECDVT (2009) adapted from UNEP et al (2008). ETUC et al. (2007). ECOTEC (2002a). Dupressoir (2008). Cedefop (2008a)

Recognizing these, TVET approaches need to be closely examined to specifically define skills development strategies and develop specific occupational skills needed in the expanding economy. Having a guiding framework for a 'greener TVET' will provide useful reference to this direction not only in terms of skill development, but most importantly, in terms of developing a comprehensive reference point for meeting the challenges of the green economy through TVET.

### 5. International Framework for Greening TVET for Green Society : a three-tier approach

Transitioning to a sustainable and low carbon world is a challenge for all sectors. Greening economies and societies is closely linked with creating a green '*humaninfrastructures*' that possess the knowledge, skills and attitudes to act as catalysts of sustainable TVET transformations.

Increasing TVET relevancy and performance borders the development of policies that can support the creation of needed '*humaninfrastructure*' that are oriented to and prepared for green jobs and green technologies available in green economies. Much emphasis is needed to make TVET adapt with structural changes. Mapping the relevant approaches to ensure that TVET systems are able to respond to skills needs for green development is an imperative.

Unfortunately, making TVET oriented to green economy is no easy task. So far, it has been approached in many different ways that are lacking in coherence and comprehensive approach.

In visualizing a common framework, three tiers need to be established. First, it has to be founded on an environment where a critical mass (*human infrastructures*) possesses the common capacity and shares similar objectives and goal. Transforming TVET institutions will form a coherent network that can set the agenda for green policy formulation that can support the mainstreaming and sustaining of green-oriented institutions as a national movement.

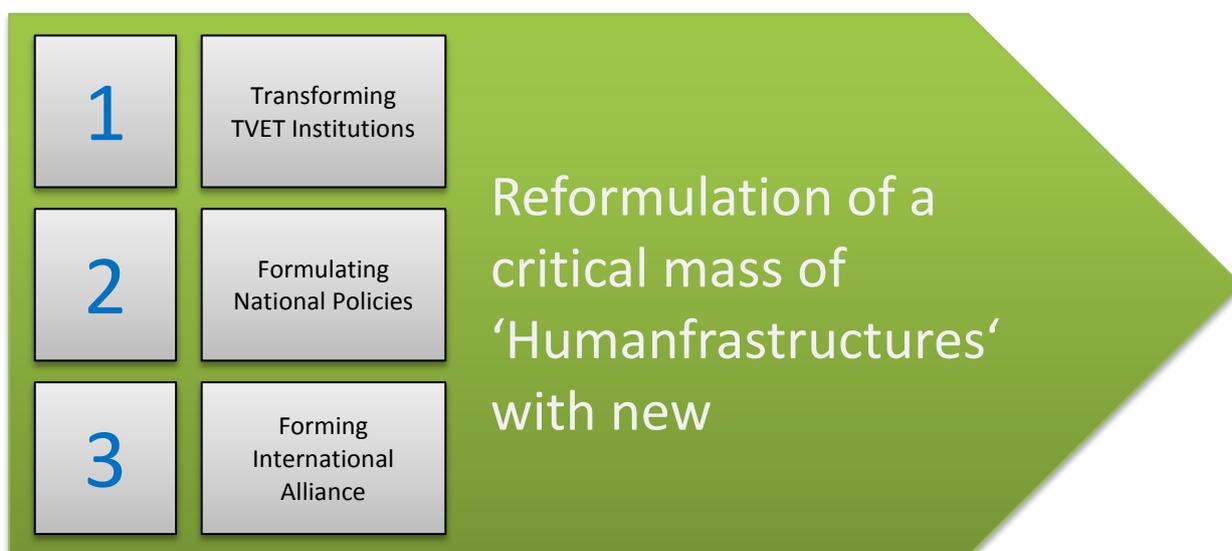


Figure 1: 3-tier approach to a green TVET framework

## 5.1 Tier 1: Transforming TVET Institutions for the Green Society and Economy

As resources continue to be used and depleted, transition to a green society and economy is expected to drive new developments, new jobs and new skills requirements. Thus, a new way of thinking needs to be made, particularly from those sectors with direct responsibility to produce skilled workforce that can be absorbed in the labor market.

Different ways to improve skills supplies in critical sectors like engineering, manufacturing, science and technology form a **hugely differentiated approach by TVET institutions in that it is should not limit itself to being mere suppliers in the labor market, but build their own capacity to supply adequately-skilled workforce that are capable of framing new demands and directions, adhering to the goals of the green economy.**

The development of institutional frameworks and standards is the crucial formative process in developing the critical mass of TVET institutions oriented to sustainable development. TVET institutions must play a key role in developing an education and training policies and standards drawn in the context of careful analysis of what surrounding business goals enterprises and companies try to achieve, where their priorities and investments are, and what products are being produced over a period of time. Once this is established, institutional practices, curricula and program contents, instructional process, capacity development of teachers and institutional engagements need to be reviewed and adjusted to reflect institutional processes and products that are green-oriented, to begin with.

**Note that rather than being mere suppliers in the labor supply chain, green institutions must have the parallel role of determining the nature, quality and qualifications of its 'supplies' to be those that influence green development, rather than purely satisfy the economic aspect of labor.**

Transformations in massive scale will create the critical mass of green TVET institutions needed to tap vital components of educational processes and support the growing needs of the green society and green economy.

A holistic framework is needed to transform TVET institution in a comprehensive manner to support green society and green economy. It cannot be achieve by piecemeal or ad hoc approach. The author (Majumdar, 2010) has proposed five dimensions of greening TVET frame work at institutional level as presented in Figure 2.



Figure 2: Five Dimensions of Greening TVET

Greening TVET is considered as one of the holistic frameworks for smooth transition to sustainable and low-carbon world in the TVET sector, as illustrated in above figure. A suggested framework is such that is built upon five dimensions to anchor sustainable development principles in TVET institutions. The first dimension is called the **Green Campus** which is based on the philosophy of practicing what is being preached in managing campus resources such as energy, water and waste resources. This dimension intends to reduce the carbon footprint of students, teachers and staff within the TVET institutions. The second dimension touches upon programs on **Green Curriculum and Technology** to meet upcoming skills for clean and green jobs. The third dimension has a major consideration on the need to build a green community through **Green Community** to extend sustainable development practice at the community level so that the movement of TVET institutions is extended to the society at large. The fourth dimension is on **Green Research** to foster the development of a research culture in relevant areas of sustainable development. Fifth, promoting a **Green Culture** is intended to focus on strengthening values education, ethical standards, attitudes and behavior that respects ecological resources and values the future requirements of the future generation. On this basis, the author identified the imperatives in making a sustainable TVET institution, as illustrated in Figures 2. Supporting sustainable practices and scope of the initiatives are identified for each dimension.

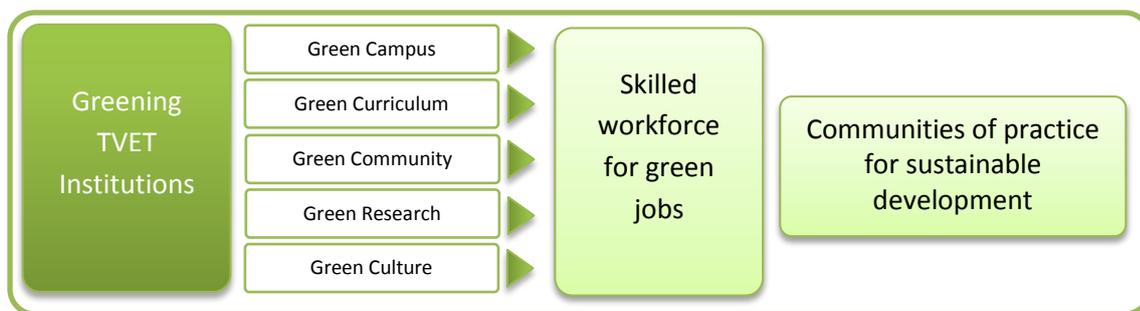
The vibrant integration of sustainability into TVET is most effective having both enablers and drivers working in synergy. Institutional value statements, penetration of sustainability principles in administrative and pedagogical systems, community involvement, participation and ownership lead to clear educational content restructuring and transition to a sustainable world.

### **Greening TVET indicators**

Greening institutions can take place through the development of green indicators to determine the goals and objectives and evaluate implementation of sustainable development approaches within institutional frameworks.

Sustainable TVET institutions are managed with the higher objective of providing a holistic educational process where both the teachers and students are not only exposed to learning and pedagogy but also experience being part of an institutional green operations and experience having personal involvement in such ways where decreasing global carbon footprint, rationalizing consumption of energy and use of resources are communal responsibilities.

The five dimensions can serve as a sound basis for formulating further important indicators to gauge sustainability standards. The indicators could provide the framework to align institutional operating systems with acceptable mitigation and adaptation trends, which range from gauging the emission of CO<sub>2</sub> per student, percentage of materials recycled, recycled materials purchased, percentage of decrease in use of toxic materials, percentage of renewable energy generated and consumed, percentage of organic waste composted, water use etc.



Within this framework, the educational processes and program contents can be made measurable to produce desirable technicians and workforce equipped with skills to properly consume and conserve resources. Moreover, values, ethics and behavioral content of courses subscribe to mitigation and adaptation principles.

The following table illustrates Green Criteria in a TVET institution and corresponding indicator which can be more refined and developed.

Green Criteria and Indicators		
	Criteria	Indicators
Criterion I.	Green Campus	Green policy and objectives
		Resource management
		Management systems for M&E
Criterion II.	Green Curriculum	Green programs and courses
		Green practices in classroom and lab
		Industry-Institute interaction
Criterion III.	Green Community	Green practices at community level
		Community participation
		Innovative programs and projects
Criterion IV.	Green Research	Research programs in SD
		Impact and outcome
		Management and monitoring
Criterion V.	Green culture	Values and practices
		Participation and involvement
		Innovative programs

Using a green scorecard method, greening of TVET institutions may be further benchmarked according to institutional sustainable practices and observation parameters.

## 5.2 Tier 2: Formulating National Strategy to achieve green growth

To support the above framework of transforming TVET institution in a new way of development, a national policy need to be developed to have a comprehensive green growth policy covering all aspect of greening society transformation including green growth strategic plan, energy, food and water security & policy, carbon emission targets, research and development policy in green and clean technology, and all related policy development

including green TVET framework. Capacity development to formulate the entire above policy requirement is an urgent task.

A range of policies linked to arresting climate change are mounting across the EU region. These range from developing energy efficiency standards to limiting national emissions. In accelerating environmental protection across Europe, more and more green jobs are being created in the labor market.

Similar trends are happening across Asia. Bent on creating a cleaner, climate-resilient and decent jobs, economic restructuring are significantly taking place particularly in advanced and growing economies in this region, like China and Korea. UNESCO projects more jobs created in renewable energy, retrofitting of existing buildings, mass transportation, wastewater management, environmental conservation and energy. Industries like steel, aluminum, cement or paper production have their fair share of green jobs created with the reformulation of new economic strategies across global economies. China, Indonesia, Japan, Republic of Korea and Thailand are leading in the Asian region's efforts to pump 'green stimulus packages' towards low-carbon economy.

Policy formulation forms a substantive national framework in setting a green development agenda. South Korea exemplifies a good direction to achieve sustainable future with the formulation of Korea's Green Growth Policy. As a national policy, it sets the overall direction to achieve new growth opportunities. The Government of South Korea maps its direction by envisioning a (1) low carbon society, (2) energy security, (3) strengthening climate actions, (4) developing green technology, (5) fostering green industries, (6) innovating with green industrial structures, (7) building green economy, (8) emphasizing green land transportation, (9) facilitating green life revolution, and (10) acting as a global green leader. From the environment, economic and industry point of view, the key framework covers huge area to be realized, which need to be complemented with an equally-clear educational framework to create the critical mass who can operational the green vision and investments.

To augment socio-economic policies, and the sophisticated ventures towards green development, most notable policy approach in the education sector is formulating educational strategies that cultivate and promote low-environmental impact applications of skills and technologies and promote environmental stewardship at personal and professional levels. Introducing and sustaining institutional operations in line with this will also require a big shift in the reform agenda in education and training content, qualifications development. Needed public investments in eco-friendly training equipment, facilities, resources and methods also require serious consideration to sustain realization of institutional-level green education agenda.

**Case study:** Expanding a green workforce by preparing students for high-skill, high-wage employment in a clean energy economy has become a US federal government priority implemented through the quad-partite project in at least five states: Georgia, Illinois, New Jersey, Ohio, and Oregon. The said states agreed to develop green career and technical education curricula in collaboration with the federal education department with the support of the National Research Center for Career and Technical Education. Under the project, each state has identified priority sectors for which secondary and post-secondary programs that will lead to certificates and associate and bachelor degrees are to be created. For example, the state of Georgia will focus its efforts on construction, energy, and transportation; Illinois on energy, utilities, and waste management; Ohio will take up agriculture, biotechnology, and energy; while Oregon will focus on construction and solar and wind energy. (Source: <http://www.thejournal.com>)

Green education reform policy formulation is parallel with meeting green skills occupation in the labor market. National Education for Sustainable Development (ESD) strategies provide policy support to wider implementation of green education and training. Having this in place, TVET sector can act as the conduit of sustainable development-oriented transformations to reverse global climate change issues that are recognized globally, and addressed locally.

The inclusion of sustainable development in formal education has been supported in existing national agenda. This comes in the form of environmental education and awareness as imperatives of learning of the 21<sup>st</sup> century, and as interdisciplinary courses adopted at the primary, secondary, vocational and higher education. This scenario, however, is not evidenced in the non-formal and informal education.

To address this, engaging TVET sector systematically will create the needed *'humaninfrastructures'*, through all forms of TVET, through the development of capacities to plan, create, formulate, design and implement reforms for green growth.

Figure 3 below presents a suggested model for utilization of national policy for green economy and connecting this with an end-product that benefits the society, the economy and the environment on a long-term basis.

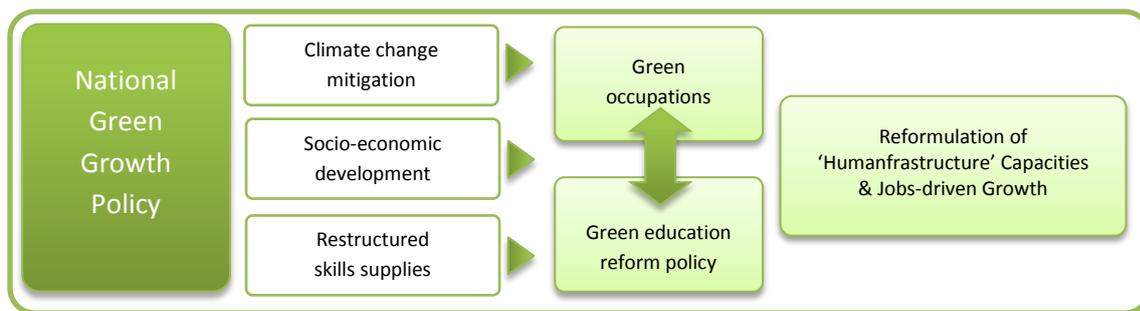


Figure 3. Utilization of National Policy towards Green Growth

National policies will be strengthened by formulating a green vision policy, regulatory trends and new qualifications. With identified green skills requirements, the vision must have a parallel scope to forecast skills requirements of the future and restructure the bases for supplying them. In support of this, capacity development programs for TVET administrators, curriculum developers, teaching learning resources need to be designed, green curriculum in TVET programs integrated and multiple players involved.

The macro- approach to ESD stems from the mapping of an overall route to national progress. It carries with it new educational paradigms and processes for reforms that makes economic and social agenda even much more achievable. In the context of national development, greening TVET will require identifying suitable growth engines which could take respective framework, strategic plans, indicative targets and financial support.

However, since ESD can be seen in different perspectives, a wide range of interpretations, reforms, interventions and impact could be derived without having a one-size fits-all model which, after all, is remotely possible in view of the different stages of development of countries.

Countries may have different priorities in adopting ESD, which can be focused on content, pedagogy or other instrumental tools. Based on this trend, the meaning of ESD is changing and its appreciation in the context of socio-economic and political policies for development may come in different contexts. Broadening participation in ESD, integration of ESD in the curriculum, formulating new teaching and learning methodologies and framing high ESD outcomes are grounded on sound education and training policy reform agenda at the national level.

### 5.3 Tier 3: International Cooperation framework in Greening TVET

Climate change is a borderless issue. It cuts across borders and across thrusts of various sectors. South-South Cooperation and North-South-South cooperation frameworks step up national level commitments --- political, economic, social and environmental, and develop the backbone to sustain them. Designing a reinforcing environment, through these cooperation frameworks, links national agenda with international and multilateral approaches and enhances its successful implementation. International cooperation forms collective resolve, reinforce commitments; opens up a playing field to lay down commitments and defines the parameters of agreements and recognitions. These help in determining the alignment of the objectives of national-level policies and capacity development initiatives with international standards and benchmarks.

UNESCO has undertaken the Greening TVET initiative in line with the United Nations Decade of Education for Sustainable Development (2005-2014) and the UN Framework Convention on Climate Change (UNFCCC COP15). While the work remains in progress, serious focus must now begin by considering a framework that will define the participation and ascertain the role that needs to be played by relevant sectors. TVET, being one of these sectors, will be the particular focus of this initiative.

The development of an International Framework for Greening TVET has been identified by UNESCO as an initial activity and considers significant outcomes of previous works, discourses and deliberations led by UNESCO and its specialized agencies. One of which is a set of discussion outcomes of the UNESCO International Experts Meeting on Learning for Work, Citizenship and Sustainability in October 2004. Suggestions and strategies for action planning were laid out. They span advocacy and vision building, review of existing national and regional policies, development of guidelines, capacity building and training programs, networking and partnerships, learning support materials and resources and monitoring and evaluation.

The international framework builds upon all seven key areas of TVET for sustainable development strategies. Specifically, capacity development, will serve as a pivot of the initiative consistent with ongoing efforts in this direction. International organization must act now to address growing challenges related to ESD. This requires substantial political commitment. The international community should send strong signals to support for green TVET and also set the strategic framework in which programs and initiatives can work to introduce green TVET.

While a growing number of programs, pilots and initiatives are being implemented, mapping and visibility remain key challenges, one of which was undertaken by CPSC and piloted in Asia-Pacific region. The initiative is built upon identifying a preliminary framework that talks about five dimensions namely (1) Green Campus, (2) Green Technology (3) Green Community, (4) Green Research, and (5) Green Culture.

Sharing of good practices, collectively addressing borderless issues, improving coordination and support for capacity development as well as monitoring and evaluation are outcomes of international cooperation. TVET must take advantage of these default provisions and make use of them as scaffoldings of TVET sector initiatives for developing regionally and internationally accepted green TVET standards and policy frameworks.

## **6. Conclusion**

Looking into a three tier approach to achieving greening TVET for sustainable development will provide a useful framework to identify strategy, incorporate green agenda and realize the outcomes and potential dividends in support of green society and economy. It is but logical to see an approach that circumvents all the composites of a sustainable development framework. Greening TVET institutions will form as foundation for building the social framework; formulating national green growth agenda will form the basis for pursuing environment-responsible economic framework that incorporates the important role of education sector particularly the technical and vocational education. The international cooperation will form as reinforcing mechanism to form network of nations that cooperate in realizing a sustainable low carbon future.

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