

Protecting the future: The role of school education in sustainable development – an Indian case study

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Abstract

This paper explores the potential contribution of education to sustainable development. Drawing on recent evidence it argues that education could play a stronger role – a position reinforced by the new sustainable development goals (SDGs). However, securing this contribution will have to be achieved in an era where educational delivery will be increasingly impacted by climate/environment change. The paper explores the relationship between education and sustainable development through an Indian case study. It covers why education is important; impediments that reduce educational impact, and an innovative programme of environmental education that offers insight on ways forward.

Keywords: education, sustainable development, India, Sustainable Development Goals

Introduction

At the risk of oversimplification the conclusions of the seminal Stern Report (Stern, 2007) on how to address climate change can be distilled into three broad themes: carbon pricing, technological innovation/transfer, and behavioural change. Of these, education is central to two: higher education plays a key role in developing and sharing technological advances, and school and community education in behavioural change. While acknowledging the role of higher education this paper focuses on school education. It argues that while climate change presents significant challenges to education, education also provides a powerful means through which to respond.

Education's ultimate contribution to sustainable development will come through both individual and societal behaviour change – strengthening environmental resilience, and inculcating climate change awareness. As Stern (2007: xxvi) notes 'Educating those currently at school about climate change will help shape and sustain future policy making, and a broad public and international debate will

support today's policy-makers in taking strong action now.' More broadly, evidence on the impact of education in support of sustainable development is encouraging. A World Bank (2010: abstract) study states: 'Educating young women may be one of the best climate change disaster prevention investments in addition to high social rates of return in overall sustainable development.' A recent econometric study suggests female education (combined with family planning) is cheaper and provides larger impacts on carbon emissions abatement than direct low-carbon energy options (Wheeler and Hammer, 2010). While Muttarak and Lutz (2014: abstract) conclude 'public investment ... through education can have a positive externality in reducing vulnerability and strengthening adaptive capacity amidst the challenges of a changing climate.'

India: Environment, vulnerability, and development

The future of humankind will be determined by their ability to deal with the twin issues of climate change and development. As Stern (2015: 3) notes, 'The challenges of development, growth, poverty reduction, and sustainability are deeply and intricately interwoven with those of mitigation of and adaptation to climate change. It would be deeply damaging to try to treat them as separate entities for action and for finance.' India is in the front line of managing this nexus of climate-environment-development challenges. Set to become the world's most populous nation, experiencing rapid industrialization, with a high level of exposure to climate/environment change and a prominent voice in climate negotiations, what happens in India will affect the world. Therefore the ability of education to inform and equip the next and future generations of Indians about the causes, consequences of anthropomorphic environmental change, and responses to it are pertinent not just to Indians but to all humanity. From here on the paper uses the generic term 'environmental change' to describe the combined impacts of human activity on the environment (and the people living in it) – anthropomorphic climate change is regarded as a 'driver' which in combination with other factors results in change in environmental conditions to which populations must adapt.

There is broad acceptance that education plays an important role in breaking the intergenerational cycle of poverty, being variously associated with increased earning potential, improved health outcomes, and reproductive choice (Rose and Dyer, 2008). Similarly, while there is debate around levels and direction of causality, there is consensus on education's role in supporting national economic growth (Hanushek and Wößmann, 2007; Altinok, 2007). The extent to which 'economic growth' is synonymous with 'development' and further what constitutes sustainable is pertinent, contentious, and vigorously debated. However, what is clear, and what the following review of India's environmental vulnerability seeks to establish, is how interconnected these issues are.

The combined factors of geography, large population, a dependence on rain-fed agriculture, rapid urbanization, poverty, and weakly developed physical and financial risk mitigation means India is highly exposed to environmental shocks. India is first ranked in a multi hazard index both in historic exposure and predicted future impact (Shepherd *et al.*, 2013). It also ranks highly in indexes capturing exposure to climate and natural hazard vulnerability (Maplecroft, 2013).

Table 1: Maplethorpe Global Climate Change and Natural Hazard Vulnerability Index: Asia region countries

	Natural Hazard Vulnerability Index	Climate Vulnerability Index
Bangladesh	1	1
India	2	20
Pakistan	8	24
Nepal	15	22
Myanmar	16	16

Source: Maplethorpe, 2013. Total countries: 67

A recent report projecting impacts of a world warmed by 4°C (World Bank, 2013a), a scenario deemed highly likely by many scientists (World Bank, 2012), portrays a disturbing picture. It suggests that by the end of this century rises in temperature, glacial melt, fluctuating precipitation levels, and falling ground water resources could have wide ranging impacts on India including: declining agricultural productivity; access to potable water; reduced hydroelectric power generation; and disruption of commerce and agriculture through coastal flooding and salinization.

A review of detailed projections are salutary; a temperature increase of 2°C–2.5°C over pre-industrial levels by the 2050s is predicted to limit agricultural production in the river basins of the Indus, Ganges, and Brahmaputra (rivers heavily dependent on glacial melt water) potentially impacting on food adequacy for some 63 million (World Bank, 2013b). The monsoon is also expected to become more unpredictable resulting in greater incidence of both flood and drought. Such changes could be expected to have implications for nutritional status, access to potable water, and safe sanitation.

Of India's 7,516 km of coastline, close to 5,700 km (the whole of the east coast and the Gujarat coast on the west) are at risk to cyclones (Government of India, 2009). It is estimated that India's coastal population could be as high as 100 million, with 18 cities of over one million people, including the commercial hubs of Kolkata and Mumbai (TERI, 2010a). Over the long term India's low elevation coastal zones are particularly vulnerable as coastal areas close to the equator will experience larger

rises in sea level than at higher latitudes. The potential impacts of coastal inundation are significant, ranging from large-scale population displacement, disruption of commerce, and reduced yields from agriculture (through salinization) and fishing (as a result of fish moving into deeper/cooler waters).

Environmental stress is already having economic impact. Recent World Bank estimations put the current cost of environmental degradation in India at about US \$80 billion annually. Air pollution constitutes the major cause of economic loss, followed by croplands degradation, inadequate water supply and sanitation, pastures degradation, and finally forest loss (World Bank, 2013b). Looking to the future it is projected that a 2.5°C temperature rise could result in five per cent loss in India's output (Nordhaus and Boyer, 1999).

The limited work that has been done on the costs of adapting to climate change in India are salutary – \$141–5 million to address increased incidence of malaria, diarrhoea, and malnutrition; a loss of \$1–1.5 billion per year as a result of decreased yield; and potential costs of up to \$760 million per year until 2030 to fund coastal zone adaptation (TERI, 2010b).

The cost of mitigation measures may coincide with a reduced ability to raise funds. Ratings agency Standard and Poor's expects climate change to impact on creditworthiness potentially leading to reduced economic growth and public finances. Poorer and lower rated countries will typically be hit hardest. According to Standard and Poor's (2014) India ranks in the most vulnerable set of countries – placed at 101 out of 116 countries, where one equates to least vulnerable to climate change. Impaired financing will impact on social expenditure, including education.

Impact of environmental degradation on education delivery and results

What is clear from the above is the impact of environmental change is going to feature prominently in the lives of India's upcoming generations. As a recent report notes, 'Considering the importance of child health and education for long-term prospects, productivity, and income, even a moderate impact of climate change on health and educational achievement could affect poverty visibly over the long term' (World Bank, 2015: 39). It is therefore imperative that the delivery of education is made environment change 'resilient' (e.g. buildings and systems) and, that the educational offer both: (1) raises awareness of environment 'causes and consequences'; and (2) equips students to respond to likely environmental challenges they will face (Bangay and Blum, 2010).

Environmental change can be expected to have both supply and demand side consequences on educational delivery. On the supply side extreme weather events

will damage education infrastructure and disrupt schooling as the recent 2009 and 2011 floods in India's Odisha state demonstrate (Bangay, 2013). As the World Bank (2015: 116) notes 'Children exposed to extreme natural disasters tend to spend fewer years in school and have lower educational achievement, delayed development, behavioural issues, and lower IQ.' Moreover, the rehabilitation costs of recovering from extreme weather events drain constrained education budgets necessitating spending being focused more on systems maintenance rather than improvement.

Climate change is also likely to impact on systems delivery. In all countries the school calendar has been aligned with the prevailing climate. Climate change is implicated in significant changes in seasonality. Such changes can disrupt essential tasks such as distribution of textbooks or administration of examinations. Moreover, in emerging economies it is well known that school attendance is linked to the meteorological/agricultural calendar and that disease burden also follows seasonal cycles. All these factors are important in determining student and teacher attendance, and with this educational performance.

Large-scale population displacement resulting from extreme weather events are a further likely consequence of climate change with which education systems will need to cope. Such movements could be both domestic and international (e.g. from flood-prone Bangladesh into India) presenting new challenges around language of instruction, student certification, and portability of examinations, and requiring contingency planning in response to rapid increases in student population.

On the demand side, the impact of deteriorating livelihoods will likely reduce household incomes and increase the opportunity cost of going to school, potentially impacting on school attendance. Concurrently, malnutrition and increased disease burden from malaria and waterborne disease could adversely impact on both ability to learn and regularity of school attendance. Studies in India found that a 10 per cent reduction in agricultural income caused by excessive rainfall led to an average decline in school attendance of five days (Baez *et al.*, 2010); while women born in flood years in the 1970s were 19 per cent less likely to have attended primary school (UNDP, 2007). International evidence suggests that these impacts are likely to disproportionately affect girls, raising serious concerns about gender equity (UNESCO, 2010).

From the above it is clear that within the next couple of generations India (and the world) will increasingly feel the impact of climate/environment pressures. It is a daunting challenge. As the UN (UNDP, 2007: 7) warned, 'Climate change is hampering efforts to deliver the MDG [Millennium Development Goal] promise. Looking to the future, the danger is that it will stall and then reverse progress built up over generations not just in cutting extreme poverty, but in health, nutrition, education, and other areas.'

India: Education and environment

In the following section I review the work of the Indian Centre for Environmental Education (CEE) looking at the challenges of education for sustainable development (ESD) and the principles and approaches that are seen as important for success. While recognizing an urgent need to move beyond anecdotal and 'advocacy' driven research to ensure education maximizes its contribution to sustainable development, it is stressed that these findings are not based on rigorous impact evaluation – rather secondary research of scant available literature, observation, and informal conversations with practitioners.

Much has been written on the appropriate terminology to describe environmental learning (Shalcross and Wals, 2006; Scott and Gough, 2004). This is a contested field in which important debates around 'whose knowledge', and the relative efficacy of pedagogical approaches that promote learning 'about', 'from', and 'in the environment' are ongoing. In this paper I use the term 'education for sustainable development' (ESD) firstly because this is the term used by CEE, the implementing body, and secondly it aligns with the vocabulary of the sustainable development goals. The use of ESD explicitly assumes that the expected outcome of learning goes beyond knowledge acquisition to behaviour change of individuals. Using the vocabulary of 'resilience' this could be conceived as 'adaptation' (equipping upcoming generations for the inevitable changes of a +2°C world) and 'mitigation' (inculcating a greater understanding of and responsibility for the environmental consequences of human actions). Such education, as Sterling (2001: 11) notes, requires an educational paradigm shift from 'transmissive to transformative learning'. The use of ESD as a generic descriptor in this case study may be more 'aspirational' than factually accurate, for in India there exists more of a continuum in outcomes. To illustrate, an analysis of Indian school textbooks revealed comprehensive content coverage of environment topics but no links to action (Ravindranath, 2007). Conversely, there are numerous positive examples of India school and community-focused ESD initiatives (Tomar, 2014; CEE/MoEF, 2010).

The size and diversity of India (its 1.2 billion population is equivalent to the combined populations of the USA, Brazil, Japan, Indonesia, Bangladesh, and Pakistan) has led to the evolution of a federal system. Education in India falls under the jurisdiction of both central and state governments and is known as a 'concurrent subject'. In simple terms India's education ministry, the Ministry of Human Resource Development (MHRD) sets curriculum and standards, provides targeted programmatic funding (supplemental to state budgets), and collects and publishes national education statistics (see British Council, 2014, for detailed education system profile).

India has a strong tradition of incorporating environmental issues within official documentation defining education content and delivery. This includes the national

education policy, a 1991 Supreme Court ruling making environmental education compulsory at all levels of education and inclusion in the 2005 national curriculum framework (Ravindranath, 2007).

When it comes to coverage of environmental and sustainability issues, two of India's central ministries are involved: the MHRD, and the Ministry of Environment and Forests (MoEF). MHRD's influence comes through its role as guardian of curriculum standards (formulated by the National Council for Education Research and Training) and the presence of a unit supporting work on the UNESCO Decade for Sustainable Development. MoEF is currently the more 'active partner' providing national funding for both in-school and extra-curricular ESD initiatives. In general, in most states environmental studies is taught as a separate subject in classes one to five – while in higher grades it becomes 'threaded' through the curriculum.

Centre for Environment Education

The Centre for Environment Education (CEE), an NGO supported by MoEF as well as external funding, plays a catalytic role in much of ESD in India. CEE is involved in delivery of two major national ESD initiatives: the Paryavaran Mitra (PM) 'friend of the environment' programme and the MoEF's National Green Corp programme (NGC). The close MoEF/CEE relationship of both PM and the NGC enables a dual approach of in-school co-curricular work with younger children and extra-curricular outreach via the NGC (Figure 1).

Paryavaran Mitra		National Green Corps
Curricular approach		Eco Club approach
All subject teachers are involved and responsible	Teachers	Eco Club in-charge is responsible
All students in a class are involved	Children	Select group of children from different classes
Whole class – curricular-linked classroom activities and action projects	Approach	Club approach – extra or co-curricular activities and projects
Curricular linked	Material	Supplementary material
Primary class 6–8	Class Focus	Primarily 9th and above

Figure 1: Overview of CEE twin approaches

Source: What is the Paryavaran Mitra Programme? Online.
<http://paryavaranmitra.in/Default.aspx?sID=77> (accessed 22 June 2014)

National Green Corps

Launched in 2001–2, NGC is an extra-curricular programme targeting secondary students and focusing on: biodiversity, water and energy conservation, waste and

resource management, and land use planning. The programme promotes practical action and community outreach, e.g. water harvesting, composting programmes (CEE/MoEF, 2010). The NGC has established nearly 120,000 eco-clubs involving more than four million students and one million teachers, making it one of the largest education networks in the country.

The NGC operates in a similar way to a franchise, a national programme with State-selected local implementers (for example, CEE implements in only 17 of India's 36 state and union territories). As such it is not immune to the complexities of financing and educational delivery through state, district, block, and school levels in India's vast federal system. These invariably lead to variance in the competence and energy of implementation. The patchy material available on evaluation of NGC points to objectives being unmet and strongly implies working with NGOs experienced in the ESD field would deliver greater impact (Srinivasan and Dubey, 2005). It is interesting to note that the north-eastern Himalayan states were viewed as more active and engaged with ESD for both cultural and pressing environmental reasons – anecdotal findings but worthy of more detailed investigation.

Paryavaran Mitra (PM): Friend of the environment

The Paryavaran Mitra programme aims to promote transformative education and environmental leadership. Launched in 2008, by the then president of India, Paryavaran Mitra (PM) (2013: 3) seeks to 'create a network of 20 million young green leaders ... to meet the challenges of environmental sustainability at their spheres of influence'. To date the programme reports an outreach of 219,888 schools in 646 districts, operating in 15 languages, and a digital network of 10,000 schools.

Conceptually PM follows a whole-school approach focused on threading environmental concepts across the grade 6 to 8 curricula (ages 12 to 14). This is articulated through five core themes: water and sanitation, energy, biodiversity and greening, waste management, and culture and heritage.

In its publications, PM lists nine strategies underpinning its programmatic approach. In summary: (1) linkage with the curriculum; (2) alignment to national policies; (3) a focus on community action; (4) local contextualization; (5) alignment to international initiatives; (6) motivation through recognition and reward; (7) creating lead schools; (8) optimizing synergies with government and non-government bodies; and (9) seeking partnership and building dynamic networks. In the following paragraphs I identify some of the key features of the programme and postulate their potential contribution to the programmes' impact.

A core principle of the PM is to ensure that its programmes are closely aligned with both national curricular objectives and key education initiatives. This has a number

of advantages across different stakeholders. Firstly, this approach builds trust – the education ministry does not feel that PM is challenging the mandated education programme but rather reinforcing and enriching it in both content and delivery. A good example of this is PM's inclusion of, and support for, the Government of India's continuous comprehensive evaluation into its programmes. The trust and respect that this approach has engendered has resulted in CEE staff being called upon to input into both curriculum reform and textbook writing.

A second advantage of alignment is that it raises the probability that students and parents see PM activities as relevant and reinforcing their education rather than an adjunct to school studies. In the Indian context this is particularly important as the pressure to do well in exams is tremendous. Co-curricular or extra-curricular activities that are perceived to have little direct bearing on in-school performance are less likely to be pursued.

The centrality of the teacher for success is clear in all that PM does:

The success of the programme rests upon the support and guidance of the principal and headmaster, but the key facilitator and implementer is the teacher. The teacher, working closely with students, needs to identify the local issues, curricular linkages to plan and schedule the activities to be undertaken, and provide the necessary guidance to students to do the activities in a systematic manner.

Source: Online. <http://paryavaranmitra.in/Default.aspx?sID=11>

PM has produced a comprehensive teacher handbook available in 15 languages (CEE, 2011) covering the five content themes and following a pedagogic frame of: Explore, Discover, Think, Act, Share (see Figure 2). The handbook, developed in conjunction with the quasi-governmental National Council of Education Research and Training, has unit plans comprising practical 'hands on' class activities (lessons plans). Moving beyond the classroom, practical guidance is given on both whole school and community action projects.



Figure 2: Paryavaran Mitra: Curriculum to action approach

Source: Borah, 2014.

In addition to a focus on content support, PM pays a great deal of attention to communication, recognition, and reward. There is a realization that teaching can be a lonely occupation and that sustaining enthusiasm when working in challenging contexts cannot be taken for granted. In the states where PM is a nodal implementing agency PM seeks to nurture teacher communities of practice and face-to-face student interaction through field trips and local events. More broadly PM uses the full range of media from traditional print to streamed video for sharing of lesson plans and celebrating the achievements of PM groups around the country, thereby contributing to an enhanced sense of community. Taking this further, the significance of local actions is situated in a broader context that highlights the cumulative impact of individual, local, national, and international action on sustainability through the handprint movement (www.handsforchange.org) which links with students around the globe.

India: Education, action, and assessment

While the work of India's Centre for Environmental Education provides a positive example of ESD, it, as with all ESD initiatives, struggles with the tension between education in which outcomes are 'academic' and ultimately expressed as individual exam results, and outcomes (often collective) that result in positive environmental change of broader social benefit. That is not to say these two sets of outcomes are conflicting but rather to recognize this tension and strive for a better alignment.

In a country where the quest for certification is fierce, the 'backwash effect' of examinations will always exert a strong influence on what is taught. Though India's national curriculum is explicit on inclusion of environmental topics, little is known about how this translates at state level, most importantly in coverage of environmental content within the state examinations which the majority of India's secondary-going students sit. PM staff report that the national/international Central Board of Secondary Education (CBSE) has the strongest coverage of environmental topics and schools following CBSE syllabi and examinations are frequently among the most active in CEE programmes. The extent to which this is the result of curriculum coverage and a stronger congruence between syllabus and examination content or a reflection of the fact that CBSE schools tend to cater for India's middle classes is a moot point. CBSE schools commonly serve higher-end private institutions and the well-resourced government-funded Kendriya Vidyalaya schools established for civil servants posted abroad or in provincial Indian locations.

The last decade has seen growing recognition of the potential of students to act as conduits for change. Much of this work has come from the field of disaster risk reduction (Hawrylyshyn, 2011; Antonowicz *et al.*, 2010; Mitchell *et al.*, 2009). Student engagement has been conceptualized as a continuum from expanding knowledge,

enhancing voice, through to taking action (Back *et al.*, 2009). CEE is strongly invested in this outlook with a stated intention to: 'make every child a change agent. And every child takes back the experiences and learnings from the school to his/her home/community' (<http://paryavaranmitra.in/Default.aspx?SID=79>).

In pursuing this 'student as change agent' approach CEE has recognized the inherent tension between individual exam performance and collective environmental action. It has supported environmental knowledge development within the current strictures of the school curricula while seeking to harness student knowledge in collective action, identifying the extra-curricular space as a more productive arena for community action. This is of course is a pragmatic compromise, consistent with the broader environment debate: the alignment of individual and collective incentives through which to deliver sustainability.

Conclusion

India's now chief economic adviser, Arvind Subramanian, recently co-authored a book on climate change arguing that addressing climate change will require acknowledging some irrefutable facts – a need to live within a fixed carbon budget, and that while the 'rich world' is responsible for much of climate change to date, 'emerging nations' will account for the bulk of future emissions (Matto and Subramanian, 2013). As such climate change is a truly international problem – and one that only collective global action can address. This paper has attempted to explore the global sustainable development challenge through insight into one educational initiative in India. This concluding section seeks to broaden the discussion reflecting on how best to position education in the new era of the sustainable development goals (SDGs) in order to deliver the maximum contribution to sustainability.

With the international scientific community 95 per cent certain that human activity is driving global warming (IPCC, 2014) and the World Bank warning climate change could push more than 100 million additional people back into poverty by 2030 (World Bank, 2015); the SDGs offer hope for a more integrated and mutually reinforcing approach to development that fulfils the twin moral imperatives of protecting the livelihoods of future generations while addressing the poverty challenge of today. Education has an important role to play in this quest. Recognizing this, sustainable development goal 4.7 explicitly states 'by 2030 ensure all learners acquire knowledge and skills needed to promote sustainable development' (UNDESA, 2015). However, building commitment for, and delivering on SDG 4.7 will require a significant shift from business as usual at all levels – from international policy and financing to what happens in the classroom.

At the global level the United Nations has consistently championed education both as a right and an agent of change with its 'Education for All (EFA) Goals', 'Millennium

Development Goals (MDG), and the lesser known 'Decade of Education for Sustainable Development' (DESD) (UNESCO, 2012). However, the simultaneous running of three major education initiatives may have diluted overall impact on education reform. It has been noted there were clear synergies between EFA and DESD objectives (Wade and Parker, 2008; Pigozzi, 2007; UNESCO, 2005). It is to be hoped that these can be capitalized upon under the unifying umbrella of the SDGs.

While investment in education is firmly established as a sound investment that can contribute to development, the concept of ESD – with its emphasis on 'transmissive' to 'transformative' – is not. If ESD is to establish itself as 'mainstream' it has to demonstrate its credibility, both in results and scale. As the UN notes impact of sustainable education initiatives remains 'poorly researched and weakly evidenced' (UNESCO, 2011: 9). Perhaps as a consequence, SDG 4.7 was adjudged to offer poor value for money by a panel of internationally renowned economists because of its lack of clarity and substance (Copenhagen Consensus, 2014). Those convinced of education's potential contribution to sustainability will need to move beyond a purely educational debate, engage in cross-disciplinary discussion, and utilize growing econometric and impact evidence to secure finance and international policy traction. Critically, effective deployment of ESD expertise will require greater recognition of and attention to the current parlous state of even the most basic learning in the majority of the world's schools, India being a strong case in point (see Prichett, 2013).

The new SDGs provide an opportunity for a refreshed debate about the purpose of education – what it should deliver and how best to achieve desired goals. As David Hick (1994: abstract) presciently commented in 1994, 'If all education is about the future then the future needs to be a more explicit concern at all levels of education.' Over the last decade international action on education has been framed by the Millennium Development Goals. In retrospect it could be argued that the primary and access focused MDG 2 has led to a relative neglect of secondary education (where emerging econometric evidence suggests many of the behaviour change impacts of education accrue). A reinvigorated focus on learning is also evident in the new SDGs and broader international debate. Strengthening early grade numeracy and literacy is foundational to this; however, alone it is not enough. In striving for measurable evidence that more learning is occurring it is imperative we do not lose sight of two critical aspects: firstly, how relevant is what is being learnt? And secondly, how does the way learning is imparted impact upon the agency of the learner? In both these areas – secondary education, and the curriculum-pedagogy-assessment nexus – ESD practitioners have valuable contributions to make.

There are indications of a resurgence of international interest in education's role in sustainable development (DFID, 2015; UNESCO, 2014). The logic is clear and there

has been extensive thought on the subject over the last 30 years (Scott and Gough, 2004). However, a compelling educational vision will remain aspirational without recognition of current realities and how to address them. We need to start from where we are now, as much as where we want to be. The challenge now is to close the gap between conceptual thought and idealistic rhetoric and secure the financial and human resources to deliver learning that makes a difference for all our futures.

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