EARTH CHILD INSTITUTE

PLANET 2025 NETWORK

THE POWER OF ONE CHILD + ONE TREE

BUILDING THE INVESTMENT CASE FOR INTEGRATED ACTION TOWARD A SUSTAINABLE FUTURE FOR ALL

DISCUSSION PAPER
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PREFACE

Earth Child Institute and Planet2025 Network have developed this discussion paper to introduce a seminal research-based body of work which substantiates the rights and practical value of children and their local actions in economic terms. Building on collaborative efforts to date, our goal for this paper is to influence emerging policy decisions toward acknowledgement and investment by leaders of the private and public sectors in support of child-centred, participatory approaches. Together with partners all over the world, we believe that life-skills based educationally driven tree planting and environmental stewardship by and for children in their communities will help to:

- mitigate leakage in REDD+;
- increase resilience of most vulnerable children and their families to climate change; and
- fortify the long-range planning needed to sustain a green economy.

Earth Child Institute (www.earthchildinstitute.org) is an international non-profit organization dedicated to the children and environment of our world. An associate of the United Nations Department of Public Information and a civil society observer to the UN Framework Convention on Climate Change, ECI's mission is to advocate for the rights, needs, capacities of children and to support their participation relative to climate change, access to safe water, sanitation, clean energy, education and health. info@earthchildinstitute.org

Planet2025 Network (www.planet2025.net) is a non-profit social venture developing innovative concepts to mobilize new sources of sustained financing for long term-investment in the globe's life-supporting ecosystems, including its centrepiece initiative, Power of One, dedicated to developing initiatives, partnerships, and collaborations that stimulate creativity, entrepreneurship, and innovative financing and business models in service to the whole. info@planet2025network.net

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Donna Goodman (USA) – Founder of Earth Child Institute, and Programme Advisor, Climate Change and Environment for UNICEF (2004-'08), she was named as one of the top 100 women worldwide by the International Franchise Association as President of Little Scientists® (1999). An action-oriented visionary advocating for Mother Earth and her children, Donna was lead author of "Forest Community Schools: A Child-centered strategy for mitigating leakage in REDD+"; UNICEF IRC's "Climate change and children: A human security challenge"; and "Every Body Counts, Every Drop Matters: United Nations Classroom Resource Guide on Water".

Steven Lovink (USA/Netherlands) – Founder of Planet2025 Network and Power of One, a whole system entrepreneur and advisor to organizations and initiatives, he seeks to meet the needs of the present generation without compromising the ability of future generations to meet their own needs by creating organizations as living systems aligned with nature so all life will flourish while generating Profits4Life, the quintuple bottom line (natural, social, spiritual, cultural, and economic capital)

Saloni Sharma (Zambia) – has been leading ECI resource development efforts and design of a collaborative school-based project with UNICEF-Zambia. She is working on her thesis towards a Master's in Environmental Education at New York University with a focus in environmental economics, policy and governance. Saloni is deeply committed to the cross-cutting issues of climate policy, development, biodiversity conservation, energy and the green economy.

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"THE PARTIES SHOULD PROTECT THE CLIMATE SYSTEM FOR THE BENEFIT OF PRESENT AND FUTURE GENERATIONS OF HUMANKIND, ON THE BASIS OF EQUITY AND IN ACCORDANCE WITH THEIR COMMON BUT DIFFERENTIATED RESPONSIBILITIES AND RESPECTIVE CAPACITIES."

UN Framework Convention on Climate Change, Article 3

EXECUTIVE SUMMARY

This paper further develops the April 2011 white paper *"Forest Community Schools: A Child-Centered Strategy for Leakage Mitigation in REDD+"*[1], prepared by Earth Child Institute, Planet2025 Network and partners to inform the Carbon War Room's Biodiversity Report. It describes an economic foundation for investment in innovative, intergenerational environmental reforestation and afforestation action through participatory formal and non-formal education. These approaches can and will empower the world's 2.2 billion people under eighteen years of age to build better futures through integration of life-sustaining values, practical skills and knowledge.[2] Specifically, the rights and capacities of children and adolescents and their respective gender roles are considered within the context of global deforestation and climate change through a quantitative lens that policymakers and carbon market investors will understand.

Our intention is to inform emerging social and environmental criteria in Reduced Emissions from Deforestation and Degradation (REDD+), actions associated with UNFCCC Articles 3 and 6, as well as private sector investment in sustainable communities. Moreover, this paper builds upon the white paper by assessing the role of indigenous knowledge systems as a critical strategy for addressing rapid global forest loss and achieving emissions reductions.

- Conservative projections indicate that if approximately five percent (5%) of the world's 2.2 billion children were to plant and care for 5 trees per month, investing on infrastructure for the care of the children would allow a return on the investment of more than 11 percent. Moreover, according to our model the Net Present Value (NPV) of such investment would equal 553 mill USD over 25 years.
- The amount of trees planted per child and the CO_2 price, emerge quite clearly as the two most important parameters. While the first can be controlled and shows how an increase or a decrease on the amount of trees has a proportionate effect on the IRR and the CO_2 savings, doubling its effect on the NPV. The price of CO_2 cannot be controlled unless edging practices are used.
- Estimated cost per child/school in this study is inclusive of water and sanitation infrastructure and hygiene education *(as per UNICEF WASH for Schools manual)*, to emphasize the need for integrated approaches which will reduce vulnerability of children and their families. Cost per child for tree and garden materials exclusively, in places where facilities are in place would be lower, thereby increasing investment value.

[1] http://www.earthchildinstitute.org/Forest%20Community%20Schools,%20A%20Child-Centered%20Strategy%20for%20mitigating%20leakage%20in%20REDD+.pdf

[2] Agenda 21: Chapter 36, relevant authorities should ensure that every school is assisted in designing environmental activity work plans, with the participation of students and staff. Schools should involve schoolchildren in local and regional studies on environmental health, including safe drinking water, sanitation and food and ecosystems and in relevant activities

THE INTERGENERATIONAL PICTURE

50 PERCENT OF WORLD POPULATION BY 2025

By 2025, today's children will represent more than half of the world's workers and leaders, and will be major decision-makers not only on individual consumption choices but also on choices for their communities and countries.[3] A critical strategic opportunity exists to educate and empower these young people through innovative formal and non-formal participatory approaches from an early age[4], with the critical thinking and sustainable values and tools they need to develop and lead a truly green economy.[5] These essential components will enable children all over the world to plant trees and preserve forest ecosystems, while shifting cultural and societal trends away from overexploitation of resources and environmental degradation.

Healthy environments and prosperous economic potential in the developing world are interdependent and inextricably linked to the social structures which provide for the health, education and development of those under the age of 18, who comprise close to fifty per cent of the population in many countries.[6] Female children in particular, are most often responsible for collecting firewood, water and fodder, however, as girls and young women face additional challenges as a result of depleted forests, these challenges have also been known to motivate them to become more responsible than their male counterparts in terms of environmental stewardship.[7]

Forests provide a range of ecosystem services, which when properly tapped into have the potential to generate enough cash compensation to reduce the pressures on forests and thereby abate forest degradation and deforestation. Indeed as the United Nations REDD program acknowledges: "the combined economic value of 'nonmarket' (social and ecological) forest services may exceed the recorded market value of timber, but these values are rarely taken into account in forest management decisions."[8]

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[3] UNICEF. *State of the World's Children 2011. "Adolescence: An Age of Opportunity"* http://www.unicef.org/sowc2011/

[4] Lynch, Robert. 2005. *Early Childhood Investment Yields Big Payoff.* WestEd. "One of the most important non-government financerelated benefits of ECD investment is its impact on the future earnings of participants.[10] In the long run, these higher future earnings result from higher productivity of as much as a fifth of our future workforce and will translate into higher Gross Domestic Product (GDP) levels. In other words, a nationwide ECD program that targets all poor children will result in a future workforce that is better educated and more productive."

[5] *Agenda 21: Chapter 36*, "Relevant authorities should ensure that every school is assisted in designing environmental activity work plans, with the participation of students and staff. Schools should involve schoolchildren in local and regional studies on environmental health, including safe drinking water, sanitation and food and ecosystems and in relevant activities" http://www.un.org/esa/dsd/agenda21/res_agenda21_36.shtml

[6] Differing percentage of population per country, some countries are more than 50% under 18 and some are less. http://www.unfpa.org/public/home/factsheets/pid/3856

[7] World Bank Social Development and Development Economics. 2009. Roberta Foa. Social and Governance Dimensions of Climate Change, Implications for Policy, page 18

[8] UN-REDD Program (FAQs): http://www.un-redd.org/AboutUNREDDProgramme/FAQs/tabid/586/Default.aspx (accessed December 5, 2010)

Globally, deforestation and degradation account for nearly one-fifth of the total green house gas (GHG) emissions and forests are being destroyed currently at a rate of 13 million hectares annually[9]. There is thus a significant potential for emission reduction in this sector. Over the years, carbon sequestration through the preservation of forest systems has emerged as an ecosystem service with a rapidly growing market. Forest carbon projects have traditionally been comprised of two types afforestation or reforestation (A/R), however, more recent developments through Reducing Emissions from Deforestation and Forest Degradation (REDD+) in developing countries also include provision for the sustainable management of forests. A forest carbon credit[10] represents either the removal of carbon from the atmosphere and storage in the form of biomass (e.g. wood and long-lived wood products) in quantities larger than would otherwise occur under 'business as usual' (baseline) practices, or the reduction of the loss of biomass that would have normally occurred under the "business as usual" model. Carbon credits combined with non-carbon ecosystem functions, biodiversity conservation and other socio-economic benefits has the potential to make A/R projects economically rewarding.[11]

The analysis laid out in this paper quantifies the potential economic value and other ancillary environmental benefits of afforestation/reforestation initiatives by children in schools through the proposed model.[12] By substantiating the need for inclusion of education, youth and family sectors in climate change plans and related budgetary allocations, this preliminary finding is intended to serve as a reference guide to officials and planners associated with leading sectors related to climate change and sustainable development, such as environment, finance, health, water and sanitation, agriculture, energy, urban planning and social services. This strategic positioning is intended to help to bridge gaps between sectors and generations, thereby improving the quality of education while increasing adaptive capacity of children and their families in response to the changing global environment.

"Children's knowledge of biodiversity is in decline at a time when we need future generations to be more engaged and aware in order to halt its loss. This highlights a very real need to educate our children as the future guardians of our planet, to provide them with the knowledge they need today to preserve the natural world for tomorrow."

– UN Convention on Biodiversity/Airbus study, 2009

FORESTS AND THE LINK TO HUMAN POTENTIAL

The World Bank estimates that the number of persons either partly or wholly reliant upon forests is close to 1.2 billion people, a majority of whom live in extreme poverty.[13] Deforestation and forest degradation collectively

[9] IPCC.2007. IPCC Fourth Assessment Report: Climate Change 2007. Geneva, Switzerland +

[10] One forest carbon credit is equal to one tone of carbon dioxide (1 tCO_2)

[11] Carbon sequestration projects approved under the Kyoto Protocol's Clean Development Mechanism are called Kyoto-compliant and the carbon offsets generated by such projects termed as Certified Emission Reductions or CERs (UNEP, 2002). These carbon offsets are traded in the regulatory market or compliance market. Another mechanism for investment in the carbon market is the voluntary market, which is not bound by the regulations of Kyoto protocol, and the carbon offsets in this market are traded as VERs (Voluntary Emission Reduction). One CER/VER represents one tonne of carbon dioxide

[12] AGENDA 21, Chapter 7.51: Formulate national action programmes to promote and support reafforestation and national forest regeneration with a view to achieving sustained provision of the biomass energy needs of the low-income groups in urban areas and the rural poor, in particular women and children

[13] World Bank. (2004) 'Sustaining Forests: A Development Strategy', The World Bank, Washington DC and http://blogs.worldbank.org/climatechange/deforestation-disastrous-consequences-climate-and-food-security

have a devastating impact upon the security, health and livelihoods of a large percentage of these children and their families, undermining their "human potential".[14] Children in particular are disproportionately vulnerable to these effects.

The soil erosion and diminishing land productivity that result from deforestation impacts food and water security, thereby making clear the interconnectedness of forests and human potential. This is of tremendous concern as estimates show there are over 200 million children under the age of five who fail to reach their potential cognitive development due to poor health and nutrition.[15] Strong evidence also exists for the relationship between academic performance and protein and micronutrient deficiency and hunger.[16] Diminished academic performance and capability in turn negatively impact adult earnings, health and fertility, which collectively feed into a cycle of environmental degradation and a further deterioration in quality of life. This is merely one link in the vast chain, and says nothing of greenhouse gas emissions, biodiversity habitat destruction, and economic losses that result from deforestation and forest degradation.

Community harvested Mahogany seeds from Tree Talk, Uganda

The Girls Count report by the Chicago Council on Global Affairs indicates that "adolescent girls and women are the key to fully realizing the productive potential of agriculture. If women farmers were given the same access to productive resources as men, agricultural yields could increase by 20 to 30 percent and reduce the number of undernourished people by 12 to 17 percent."[17] Girls' responsibilities at home and on the farm give them unique knowledge of local crop species and environmental conditions, making them natural players in resource management and risk reduction associated with natural hazards.

Empowering children, especially girls, to free themselves from poverty and to build sustainable livelihoods is both a key role for education and a prerequisite for child friendly schools, which programmatically consider elements of society, environment, health and economy from a child-centered rights-based perspective. Education and learning are part of an iterative dynamic of social change: in order to change society, we need to change the way we learn and educate, and in order to change the way we learn and educate we need to change society.[18] In recent years, this question of what kind of education is most beneficial has gained scholarly attention, and has also entered the policy arena. Increasingly, policymakers have been looking to the knowledge systems of forest-dependent indigenous communities. These were awarded official recognition as a key contributor to climate change mitigation and adaptation in 2009.[19]

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[14] Bangay and Blum (2010)

[15] Ibid.

[16] CREATE. 2008. 'Impact of Health on Education Access and Achievement', Policy Brief Number 3. CREATE and University of Sussex, Falmer

[17] Chicago Council on Global Affairs. 2011. Girls Grow: A Vital Force in Rural Economies.

[18] Gebara, M.F., BENEFIT-SHARING MECHANISMS FOR REDD: HOW TO EQUITABLY SHARE BENEFITS AMONG FOREST MANAGERS? OCTF and CIFOR, 2010. "The most concrete benefit of JUMA up to now is, undoubtedly, the provision of education through the establishment of the main school of the project. Indeed, the majority of the academics interviewed believed that from an equity stand point local adaptation and capacity building must be the main focus when sharing benefits in a REDD+ project." CIFOR's Global Comparative Study. Outcome of first Brazilian REDD project in Juma.

[19] IUCN. 2010. 'Indigenous People and REDD Plus: Challenges and Opportunities for the engagement of indigenous peoples and local communities in REDD Plus'. *IUCN*

ANIA CHILDREN'S LAND

On average, to maintain our consumption habits we need 22 hectares per person and there are only 15.7 hectares available (Report GEO 4, UNEP 2007). Without a doubt, radical changes are required of our values and behaviour with regard to how we consume and treat nature. If we consider that values are absorbed during childhood, the situation becomes more alarming as so many children grow up completely disassociated with nature, and ignorant that their well-being depends in part on the state of their environment.

ANIA has created the Children's Land (TiNi) initiative, with the mission to develop the knowledge, abilities and values in children that will enable them to confront the environmental issues we face and, in the process, to build a culture of unity with the natural world. A "TiNi" is a space as small as half a square meter given by adults to children, where they nurture life and promote biodiversity. In the process, they strengthen their self-esteem and identification with their environment. In the TiNi children implement actions which will benefit: 1) themselves, 2) their families and other people, and 3) nature. In places where there is no access to land, children can do their TiNi in a plant pot with a minimum of three plants (one plant for them, for the other, and one for nature).

A TiNi can be implemented by a child from any socio-economic or cultural background in an urban or rural area in the home, at school, in the neighborhood or the community, and in a number of ecosystems. Depending on its location and size, the TiNi may be known as; Children's Plant Pots, Children's Garden, Children's Forest, Children's Mountain, Children's Lake, Children's Beach etc. To date, in Peru have been granted more than 180 hectares to more than 5000 children in 24 areas, and TiNis have been initiated internationally, in Brazil, Bolivia, Colombia, Chile, Paraguay, Scotland, India, Japan and Canada.

In partnership with Earth Child Institute and others through the Power of One Child + One Tree global network of organizations working with children and the environment, ANIA's goal is to establish more Children's Lands in Latin America and other regions, and to inspire the creation of a new development indicator which acknowledges the contribution of children to the well-being of society.

FOREST AND INDIGENOUS KNOWLEDGE SYSTEMS

There are over 60 million indigenous people entirely dependent on forests.[20] Their contribution to carbon emissions remains among the lowest in the world.[21] The move towards the protection of indigenous rights, values and knowledge has gained momentum. Within the deforestation context, this has happened directly through an acknowledgement and call to action within the REDD Plus program, which has applied a rights-based approach and updated its mission to align more closely with the objectives of the UN Declaration on the Rights of the Indigenous Peoples. However, the International Union for the Conservation of Nature (IUCN) notes: "Indigenous peoples and local communities of the world are still far from having full recognition of their rights and interests."[22] The outcomes from Durban in November 2011 remain to be seen.

[20] http://www.un.org/en/development/desa/financial-crisis/government-dialogue.shtml (accessed 10/18/2011)

[21] IUCN. 2010. 'Indigenous People and REDD Plus: Challenges and Opportunities for the engagement of indigenous peoples and local communities in REDD Plus'. *IUCN* http://cmsdata.iucn.org/downloads/iucn_briefing_ips_and_redd_aug_2010_summary.pdf (accessed 10/21/11)

[22] Ibid

An integral component of indigenous culture is indigenous knowledge, often interchangeably termed local or traditional or ecological knowledge. The particular relationship of indigenous knowledge and traditional education and schooling is however less well understood. A number of studies in recent years have revealed the existence of a tension between the two, and a review of the evidence points in both directions.[23] The United Nations' stance on this, however, is markedly in support of the view that the acquisition and transmission of indigenous knowledge and languages continue to be significantly undermined by traditional education models perpetuated by a number of exogenous actors.[24]

Meanwhile, there is clear evidence of the dynamic properties of indigenous knowledge systems and, by extension, their potential to develop pro-environmental attitudes and action. A host of educational and anthropological research confirms this.[25] In addition there exists a growing body of literature that has explored the impact of declining indigenous knowledge on ecological diversity,[26] and while further research is needed in this area, it is hardly a stretch to assume the loss of indigenous knowledge has inevitable consequences for natural resource use, consumption and management.

This reality has significant implications for how today's children and future generations will perceive and interact with the world. It is therefore up to policymakers and other stakeholders to design dynamic educational systems, both formal and non-formal, that leverage key features of indigenous knowledge to ensure protection of direct and indirect ecosystem services.

The above evidences thus reaffirm the fact that both community participation especially of children and recognition of the rights of forest communities through empowered indigenous knowledge are important to success of any forest carbon sequestration project. So, taking into account the above perspectives, an afforestation/reforestation carbon sequestration model has been developed to show the potential of community schools as instruments of environment conservation through their promotion of indigenous knowledge systems. The model reflects the strength of community schools and children as important components of forest carbon projects and how their involvement as active participant in such projects, could ensure effective implementation of afforestation/reforestation projects and reducing leakage of carbon emission in REDD plus.

[23] See Srithi et al 2009, Quinlan and Quinlan 2007, Sternberg et al 2001, Zent 2001, Godoy et al 2009, Ayatunde et al 2008, Byg and Balslev 2001, Levinson et al 1996

[24] UNESCO. (2009). Learning and Knowingin Indigenous Societies Today (editedby P. Bates, M. Chiba, S. Kube & D. Nakashima). UNESCO:Paris, 128 pp.

[25] Zent and Zent (2009), Lozada et. al (2006), Katz (1989), Lave and Wenger (1981)

[26] Estomba et. al 2006, Case et. al 2005, Voeks and Leony 2004, Begossi et. al 2002

BUILDING THE INVESTMENT CASE

STRUCTURE OF MODEL

The model for analysis of financial viability builds upon the inclusion of the 2.2 billion strong population of children and adolescents in the world, in the movement to re-forest and re-energize local environments and social constructs, thereby helping to ensure a sustainable future for those children, their families and communities. It acknowledges the variation of project timelines in REDD which span between 10-45 years, initially looking into a window of 25 years and further takes into account commonly accepted assumptions and references from different sources.

We note that our present effort has given only superficial consideration to the value of early childhood learning, indigenous practices, intergenerational equity, capacity development for 'green jobs',[27] and gender sensitivity within the economic analysis. Next steps for this body of work plans to consider further value through in-depth review of recent studies which quantify the effects of girl's education as well as those which have found that investing in high-quality early childhood development and primary school programs[28] can positively impact children, their families, and their countries.[29] For instance, a body of evidence is known to substantiate increased adaptive capacity of literate over illiterate farmers.[30] Additional work is needed to adequately represent this population within the model.

According to the IPCC Second Assessment Report (SAR II, 24.4.2.2), the potential land area for implementation of forest conservation and sequestration globally might be 700 million hectares (Mha). Based on technical suitability and access to the land, this figure comprises of 345 Mha for plantations and forestry, 138 Mha for slowed tropical deforestation, and 217 Mha for natural and assisted regeneration. Afforestation and reforestation thus have the maximum potential for carbon conservation and sequestration both in the tropics and temperate regions. The area aimed for afforestation and reforestation in the analysis is assumed to be primarily community owned degraded or deforested land. Since financial benefits and all other forest derivatives from the project would be received by the community, it is assumed in the model that no costs would be incurred on land leasing. However, as properly defined land rights are important to access carbon markets, the responsibilities and incentives would be shared among the community school and other land rights holders of the community depending on the tenure rights of the land.

According to the Congress Research Service Report R40562, each acre of plantation on previous cropland or pasture has the potential to sequester 2.2 -9.5 tonne carbon dioxide (tCO_2) per year in case of afforestation while

[27] UNICEF East Asia Pacific Region. 2011. Children and Climate Change. "All schools should work to raise students' 'environmental intelligence'. Technical and vocational education and training as well as non-formal education need to also adapt to the requirements of low-carbon economies (such as jobs in green technologies)".

[28] They also found that literate farmers are more likely to adopt first.

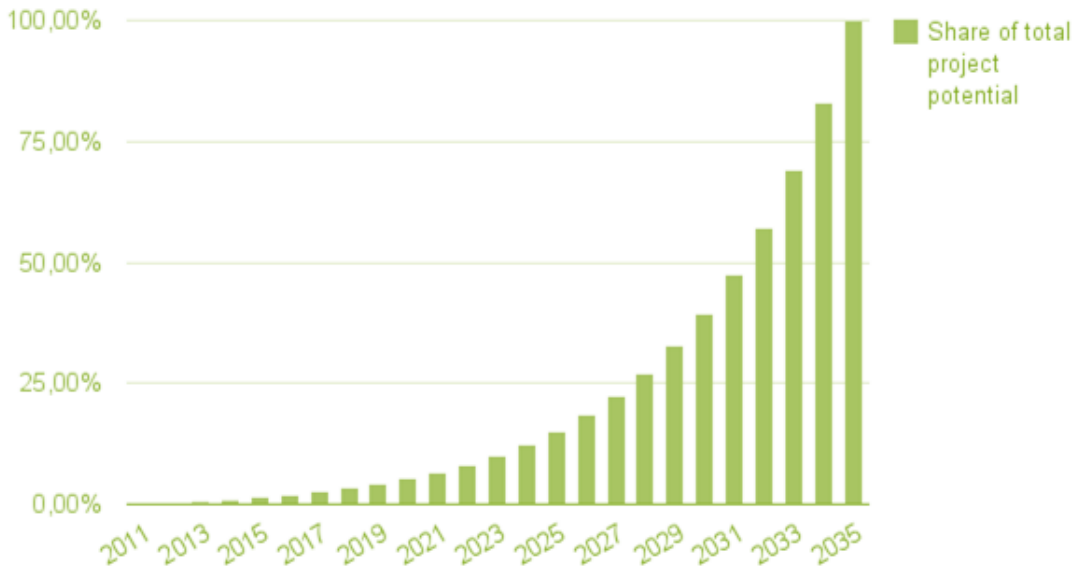
[29] Lynch, Robert G. 2005. Early Childhood Investment Yields Big Payoff. Wested Policy Perspectives

[30] Bandiera, Oriana and Imran Rasul, 2006,"Social Networks and Technology Adoption in Northern Mozambique," *The Economic Journal*, October, 116, 869-902.

reforestation has the potential to sequester 1.1-7.7 tCO2 per year. In this model, the potential of carbon dioxide sequestration per acre of tree plantation is taken as 2.4 tCO2 per year, which is well within the potential range as stated above[31]. Further, on the basis of 2.4 tCO2 per acre or 6 tonne of CO_2 per hectare and 500 trees per hectare[32], it is estimated that nearly 83 trees are required to sequester one tonne of carbon dioxide per year.

In terms of participation, the model assumes the active involvement of a very conservative estimate 5% of the world's 2.2 billion children and a population growth at the rate of 1.1% for future projections[33] is also taken into account. Further, considering the availability and capacity of schools and non-formal educational activities led by primarily by youth and faith-based organizations, it is assumed that each child would be able to plant and further take care of 5 trees per month. A ramp-up plan has been considered to reach the max potential over 25 years as shown in Figure 1. The ramp-up plan assumes that every year the amount of children added to the program is 20% higher than the previous year, so that the full potential which corresponds to approximately 145 million children and equals to over 8.5 billion trees planted is reached in 25 years from 2012.

Figure 1: Ramp-up plan



Under the model, the project costs considered are the initial capital investment and other costs. The capital expenditure accounts for the cost of seedlings[34]and infrastructure necessary to establish environmental facilities[35] *(water, sanitation, access to energy and garden materials)* in participating schools in the territory, totalling 0.37 USD/tree. Operational costs include the costs incurred for the maintenance and management of the plantations.

[31] UNEP One Billion Tree Campaign, http://www.unep.org/billiontreecampaign/

[32] UNEP One Billion Tree Campaign, http://www.unep.org/billiontreecampaign/

[33] U.S. Census Bureau

[34] Brown, L.R. 2008. Plan B 3.0: Mobilizing to Save Civilization.pg 171. Earth Policy Institute. New York.USA.

[35] UNICEF WASH in Schools manual, 2009. Experiences in various countries show an average cost for school water, sanitation and hygiene education of US$20 per student.

Besides these, a substantial expenditure that needs to be accounted for is the transaction costs for trading the carbon credits generated from the project, which, depending upon the scale of the projects, can vary greatly. The estimates from the United Nations Development Programme (UNDP) suggests that forest carbon sequestration projects usually require an upfront cost of 1% of the total and in case of large scale projects the operational costs are found to be around 6%. This model is thus using the transaction cost at 7% of the total Certified Emission Reduction (CER) value.

The revenue return of the project is primarily accounted from the carbon credits to be generated in the project. Carbon sequestration from afforestation and reforestation would also generate other ecosystem services of very high value. But because of lack of reliable and consistent valuation of these services and highly variable economic gains from different type of forests, these are not taken into consideration in the current model. Further, for carbon sequestration projects these ecosystem services are treated as externalities. These co-benefits however ensure that the project leads to sustainable development of the host nation, which is an important criteria that forest carbon sequestration projects need to fulfil, adding to the robustness of the project. The model here thus only includes the value of carbon credits for estimating the project returns.

The price of each carbon credit, termed as one metric tonne of carbon dioxide, is estimated here by reviewing the current literature and market conditions. In this scenario, the majority of financing for the forestry based sequestration project is in the voluntary market and also the project procedures are simpler and transaction costs are lesser[38]. Hence, carbon credit price included in the model is in alignment with the voluntary markets and set to 5.6 USD / tCO_2.[39] The crediting period takes the minimum 20 years at present with further consideration of renewing as per the maximum crediting period allowed by the Compliant or Voluntary markets[40]. The trading of collected carbon credits is set to be done every 5 years.

Parameter	Value	Unit
Trees planted	5	trees / children / month
Yield	83[36]	trees / tCO_2 / year
Max potential	2.2	billion children
% of max potential	5	Pct
CO_2 price	5.6	USD / tCO_2
Population Growth	1.1	pct / year
School cost	10,000	USD /500 children[37]
CAPEX	0.37	USD / tree
Transaction costs	7	pct of the revenues

Table 1: Summary of the parameters used in the model

[36] 83 trees / tCO2 / year is a conservative value since it corresponds to 2.41 tCO2 / acre / year using another conservative assumption of 500 trees / ha (UNEP – One Billion Trees Campaign) and a conversion acre / hectare of 2.5. The value of 2.41 is in fact closer to the minimum value of 2.2 indicated in the CRS Report, 2009.

[37] UNICEF WASH in Schools manual, 2009. Experiences in various countries show an average cost for school water, sanitation and hygiene education of US$20 per student as basis for provision of environmental facilities on school grounds. NOTE: where WASH facilities are existing, expenses will be reduced to reflect cost of saplings, seeds and garden-related materials.

[38] Overseas Development Institute,2006

[39] DAVID DIAZ, KATHERINE HAMILTON, EVAN JOHNSON - ECOSYSTEM MARKETPLACE/FOREST TRENDS. 2011 State of Forest Carbon Markets 2011, From Canopy to Currency. http://www.forest-trends.org/documents/files/doc_2963.pdf

[40] The maximum crediting period allowed for forestry projects by CDM is a 30 years fixed or a 20 years and renewable twice crediting period while VCS (Verified Carbon Standard) allows a maximum 100 years of crediting period.

The 5 year monitoring and verification period is assumed on the basis of analysis of current market trends of carbon sequestration projects and regulations of carbon markets[41]. Table 1 above recaps the values of different parameters in the model.

RESULTS

Results shown in Table 2 refer to the output of the model using the parameters described in Table 1 and assuming an interest rate of 5 pct, which was selected as such to be in line with contemporary academic thought on the social welfare discounting framework, as well as comply with U.S. Federal guidelines on cost-benefit analysis (outlined by the Office of Management and Budget) that recommends a 3 to 7 pct rate.[42]

The long payback time is mainly due to the way carbon credits markets are run, with years between the initiation of a project, including the upfront necessary investment, and the collection of the credits. In a project like the one evaluated in this study, where an almost-exponential development is envisioned, costs are only covered fully when the project is mature and the economy of scale in which case carbon credits cover for the investment of the previous 5 years.

Parameter	Value	Unit
NPV (25 years)	553	mill USD
IRR	11.84	Pct
Payback	25	Years
CO_2 savings (25 years)	562	mill tCO2

Table 2: Summary of the results

In order to evaluate how much the choice of the parameters used in the model influence the results, a sensitivity analysis has been carried out varying the value of the most relevant parameters and looking at the difference in the outputs.

The parameters that have been tested are[43]:

- Trees planted per children
- % of max potential
- CO_2 price
- Initial investment per school

[41] The current methodologies of both CDM and Voluntary Markets (VCS) require a 5 year monitoring & verification period. In VCS, failing which 50% of the project's buffer credits are put on hold. Inability to submit verification report for next 5 years will lead to all the remaining buffer credits to be on hold. While an early verification would reduce profitability of the project with increased expense on transaction cost.

[42] Note: on the lower end, the OMB rate is based upon the social rate of time preference of 3 percent, whereas the 7 percent rate reflects an average pre-tax rate of return to private capital. It should also be noted that the more conservative choice of weighted average cost of capital (typically 10 percent) would yield a lower but still positive NPV of 99 mill USD.

Stern, N. (2006). *The Economics of Climate Change: The Stern Review*. Cambridge, UK, Cambridge University Press.
OMB (U.S. Office of Management and Budget). 2003. Circular A-4: Regulatory Analysis. Washington, DC: OMB.
EPA (U.S. Environmental Protection Agency). 2000. *Guidelines for Preparing Economic Analyses*. Washington, DC: EPA.

[43] Full spreadsheet and all data can be accessed online at:
https://docs.google.com/spreadsheet/ccc?key=0Anv4CbT0MRWVdDBkUnYzWTNVcFk3RmliVDJhdmxtRHc

The sensitivity comparison was carried out by changing the values of these parameters one at a time using those values in Table 1 as a default. So each time a parameter was changed the results were collected and the model reset to the default values before the next change was tested. Results from the sensitivity analysis are summarized in Table 3.

Table 3: Results obtained varying the input parameters

Parameter	Value	NPV (mill USD / 25 y)	IRR (pct)	Payback (y)	CO2 savings (mill tCO2 / 25 y)
Trees planted	10	1,535	19.88	10	1,124
Trees planted	15	2,516	24.98	5	1,686
% max potential	10	1,106	11.84	25	1,124
% max potential	25	2,766	11.84	25	1,686
CO_2 price	4.6	369	9.56	25	562
CO_2 price	6.6	738	13.89	20	562
School cost	5,000	767	19.88	10	562
School cost	20,000	125	5.01	25	562

Another way to look at the same analysis, is by evaluating how much of a percentage results change as a result of a +/- 10 pct adjustment of the initial parameters. Results are summarized in Table 4.

Table 4: Relative variation of the results vs a variation of +/- 10 pct of the main parameters

Parameter	NPV	IRR	Payback	CO2 savings
Trees planted +10%	+18%	+9%	-20%	+10%
Trees planted -10%	-18%	-9%	+/-0%	-10%
Max potential +10%	+10%	+/-0%	+/-0%	+10%
Max potential -10%	-10%	+/-0%	+/-0%	-10%
CO_2 price +10%	+19%	+10%	-20%	+/-0%
CO_2 price -10%	-19%	-10%	+/-0%	+/-0%
School cost +10%	-8%	-9%	+/-0%	+/-0%
School cost -10%	+8%	+10%	-20%	+/-0%

It emerges quite clearly that the two most important parameters are the amount of trees planted per children and the CO_2 price. While the first one can be controlled and shows how an increase or a decrease on the amount of trees has a proportionate effect on the IRR and the CO_2 savings, doubling its effect on the NPV, the price of CO_2 cannot be controlled unless edging practices are used (but this goes beyond the scope of this study).

Tree Talk

"Tree Talk" is one of the biggest social forestry efforts in East Africa. Focused on fighting climate change and improving the lives of ordinary people since 2006, Tree Talk has raised and overseen the planting of 3.1 million trees in Northern
Uganda and Karamoja. The seed is distributed with the Tree Talk newspaper, a fun to read educational four page A3 newspaper about the centrality of trees to people's well-being and livelihood. This newspaper is a vital part of the "Tree Talk" push and sent twice a year free to over 3600 secondary and 14,630 primary schools. The print run is 240,000 copies/issue.

Schools are already benefiting from the Tree Talk trees they have raised or been given. Some schools have harvested them to pay teachers' salaries, build school desks or teachers' houses, or provide firewood for school feeding programs. In other schools Tree Talk trees form wind breaks or provide shade. They also take pressure off the natural bush, thereby protecting habitat for wildlife and biodiversity. They also provide a living lab for science teaching.

In Northern Uganda, Tree Talk is currently working on the ground with 800 schools, 138 communities, half a dozen prisons and police and military barracks. Tree Talk is a large purchaser of tree seed from local communities, and currently raises 22 different species of tree, mostly indigenous.

A further 200,000 Tree Talk trees have been raised since 2002, when Tree Talk was launched and began to send tree seed to schools. This estimate, based on just 10% of schools growing trees from the seed, is conservative. Tree Talk has trained 2321 teachers and 954 community members and supported the planting of 3948 acres, while employing 15 young foresters, 30 nursery attendants (youth and women, many of them former casualties of armed conflict). During the potting season, Tree Talk hires about 400 casual labourers, many of them children who are carefully supervised within Tree Talks' eight large nurseries.

At the same time, achieving a higher margin of Earth Child Institute's goal to empower and mobilize a greater percentage of the world's 2.2 billion children through the Power of One Child + One Tree campaign has a direct and proportionate effect on NPV and CO_2 savings, but no effect on IRR and payback. This is quite obvious since more schools and more children translate into a higher impact yet will also carry higher costs associated with school infrastructure, professional development and maintenance.

Finally, cost per school also plays an important role that is more or less proportional to NPV and IRR, while CO2 savings are not impacted since they do not depend on cost of infrastructure but on the amount of trees planted. In this regard it is important to note that opportunities for youth engagement, non-formal education and community-based agro-forestry initiatives can measurably increase the number of trees per child without a need to burden schoolchildren with additional responsibilities. These opportunities will be explored in greater detail in the next phase of this analysis.

OTHER CONSIDERATIONS

On top of the savings already outlined, forest carbon sequestration projects have the potential to provide significant economic benefits through a number of ecosystem services. These opportunities encompass direct value, indirect value, option value and existence value. Forest plantations, depending upon their utilization can ensure a steady source of income to the local communities. This could range from sustainable timber management to extraction of NTFPs (Non-timber Forest Products) which would add to the local economy and can be important exports. The international trade of wood and other forest products contributes $600- $650 billion annually to world market economy[44]. Besides the direct utilization of ecosystem services, and serving as carbon sinks, forests also ensure climate regulation, provide watershed services and habitat for biodiversity and act as a source of a variety of genetic resources. Forests also service sectors like recreation or tourism and have significant future option and existence value overall.

According to the UNEP 2011 report entitled *Forests in a Green Economy*, the economic valuation of the ecosystem services provided by forests, excluding their contribution to wood and forest product markets and climate regulation, put forth a range of $201- $3280 for per hectare of tropical forests and $212-$119,203 for per hectare of temperate forests[45]. At this stage in our research, indicators associated with food, water, medicine and resilience to natural hazards are positively affected by taking low mid and high values of ecosystem services into consideration. In fact, it may be that non-carbon values are even larger potentially than carbon values doubling NPV and IRR. These valuations will be considered in greater detail in the next phase of this work.

Moreover, sustainably managed plantations would also reduce the pressure on the existing native forests by providing firewood, timber and alternative livelihood options. The Elliasch review (2008)[46] estimates that the average benefit of halving deforestation exceeds average costs by a factor of three. It also indicates that the net present value of reduced climate benefits associated with emission reduction from halving deforestation from 2010-2100 is US $3.7 trillion on an average.

THE WAY FORWARD

The results of the study show a significant potential which is even more interesting in the light of the numerous conservative assumptions considered in the model. The authors offer these findings to inspire carbon investment confidence in the capacity of children through schools and youth-led approaches. Moreover they hope this analysis will inform the 2011 'REDD+ Development of Social and Environmental Principles and Criteria' as well as the Forest Investment Programme (FIP) of the Climate Investment Funds which are stated to be "a learning tool that initiates and facilitates transformational change in forest related policies and practices in developing countries."

Further research and analysis are required to quantify and integrate the social benefits associated with life-skills based environmental education for sustainable development toward long-term behaviour change which is associated with enhanced skills for critical thinking and adaptive capacity. Costs per school in this paper are considered to be on the higher side, as they are aligned with UNICEF estimates to provide safe water, adequate

[44] UNEP.2011. Sustaining Forests: Investing in our common Future. Ecosystem management Policy Series

[45] UNEP.2011.Forests in a Green Economy: A Synthesis

[46] Elliasch,J. 2008. The Elliasch Review-Climate Change: Financing global forest. UK Office of Climate Change.

sanitation and hygiene education in every school to ensure reduced vulnerability of children and their families which are known to enhance learning capacity and sustainable school enrolment.[47]

Investment in integrated child-centered approaches to environmental and climate change education is essential, as is support for further research and development of this concept as a crucially important step toward realizing the rights of children as key stakeholders. Among other things, we suggest the employment of youth leaders committed to entrepreneurship[48], who can engage with and empower children toward verifiable and meaningful action in their communities.

The next step is for further research and development of this concept on five avenues for action:

1. Substantiate and integrate Valuation of ecosystem services through a child-centered approach;
2. Mainstreaming across sectors at national policy and planning level to refine a model approach for investment in the involvement of children and schools in community level climate change adaptation, disaster risk reduction and REDD+ initiatives
3. Plan, finance and implement pilot test model schools in REDD+ areas and targeted communities which are most vulnerable to impacts of climate change
4. Consider the value of empowering life-skills based early childhood and primary education, with attention on adolescent girls.
5. Informing and providing a platform for integration of these findings into the "Green Economy' agenda/platform to be considered by world leaders at the Rio+20 Earth Summit in June 2012.

To that end, Earth Child Institute, Planet2025Network are actively seeking investment partners to move this important body of work forward, building on findings toward an exponential scale up and roll-out these points through a timely and proactive approach.

[47] UNICEF, IRC. 2005. Goodman, D. Van Norden, H. Water, sanitation and hygiene education for schools. http://esa.un.org/iys/docs/san_lib_docs/sshe_oxfordroundtable.pdf

[48] Lovink, J. Steven (forthcoming), We are the Ones – A Vision of Investment and Entrepreneurship in Service of the Whole, Planet2025 Network.

EARTH CHILD INSTITUTE

PLANET 2025 NETWORK

ABOUT US

Earth Child Institute, Planet2025 Network and partners are developing a 'Power of One Child' global network. This network, comprised of grassroots NGOs, individual schools and youth leaders, working with children and the environment intends to build consensus and entrepreneurial capacity for implementation of activities with and for children in alignment with UNFCCC Articles 3 and 6. Moreover, it endeavours to establish a groundswell of verifiable resource partners who can effectively tap into GEF, REDD+, FIP and private sector investment to support formal and non-formal programs with and for children all over the world.

Modular school kits are planned to help national REDD+, adaptation project developers and individual schools, to engage with and empower children and their families in protected forest areas and ecologically vulnerable zones. The business model for schools is designed to support project budgeting from the onset, through an estimation of population density per hectare within REDD+ and targeted project areas. The model integrates both facilities-based and participatory resources, which seek to enable project developers to ensuring access to safe water, sanitation, clean energy and forest gardens within the frame of a life-skills based methodology.

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