Boosting Impact at the Base of the Pyramid: Enhancing the Uptake of Sustainable Energy

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Biography:
With over 10 years’ experience in the field of sustainable development, Amélie Héuër currently heads the research programme at SEED to provide evidence about the impacts of social and environmental entrepreneurship and its contribution to sustainable development. Prior to joining SEED, Amélie worked for several years on marine conservation and coastal resources management in the Philippines. She has specific expertise on multi-stakeholder partnerships, eco-entrepreneurship, capacity building, livelihood development and coastal resources management.

Abstract:
Adoption of existing green solutions at the Base of the Pyramid (BoP) remains a challenge due to the expensive upfront investments, the lack of infrastructure in remote areas, but also due to a lack of awareness and trust in new technologies, and due to the lack of technical knowledge and skills for the upkeep of those innovative products. Social and environmental small, medium and micro enterprises (SMMEs) offer one concrete means of addressing these issues, primarily because they are specialists in understanding local challenges and needs and with their extended local networks have the ability to reach the last-mile beneficiaries. By introducing new products, services and models that serve social needs and create new social relationships, they are able to maximise the uptake of green solutions in the long term.

While there is no ‘one-size-fits-all’ solution to clean energy distribution or adoption, the paper looks at the case of Solar Sister in Uganda, Tanzania and Nigeria, to highlight how SMMEs can introduce innovative social structures through a Triple Bottom Line (TBL) approach. Through their unique women-to-women network and dedicated women empowerment, the enterprise offers a wide range of high quality clean energy products with a long life-cycle, and has created an innovative value chain that works for those at the base of the pyramid by positioning themselves close to their markets, tailoring innovation to social needs, mitigating high costs through micro-entrepreneurship and by growing networks and expertise through multi-stakeholder partnerships. Subsequently, they have increased local awareness, trust and ownership in the innovative products, and succeeded in large scale dissemination of the new technologies at the BoP.

Keywords:
entrepreneurship, women, partnerships, ownership, base of the pyramid

1. Introduction

Why is (green) energy not reaching the Base of the Pyramid (BoP)?

While great progress has been achieved in increasing access to energy globally, indeed in 2010 the World Bank reported that 1.7 billion people gained access to electricity (Angelou et al. 2013) in the last two decades, the public and private sectors are still failing to cater for 18% of the world population (UNDP, 2015), particularly for those at the BoP. To achieve the ambitious objective of ensuring access to modern energy to all by 2030, we are faced by one key challenge; providing energy for a growing population (UN News Centre, 2015), while at the same time reducing carbon emissions. The solution rests in the green energy sector where numerous innovative technologies have been developed to enhance the end-user as well as the larger power generation efficiency and promote the switch to more efficient and renewable energies. Nevertheless the adoption of those green solutions at the BoP remains a challenge due to [in many cases still] expensive upfront investments (both at national or individual level), lack of infrastructure in remote areas (Shukla, 2011), unsuitable policies and regulations (Heuer et al. 2015 and Shukla).

1 Of the people that do not have access to electricity and clean cooking facilities globally, 84% live in rural areas and 95% are located in sub-Saharan Africa and Asia.
2 Sustainable Development Goal 7
3 Global population is expected to reach 8.5 billion by 2030. (UNDP, 2015)
4 “While technology cost for renewable energy have been reported to decline steadily (up to 98 percent in the case of for solar photovoltaic (PV) modules since 1979), renewable energy continues to have high upfront investment costs” (UNDP, 2013)
2011), but also due to a lack of awareness and trust in new technologies (Heuer. 2015), and due to the lack of technical knowledge and skills for the upkeep of those innovative products.

**Green and inclusive SMMEs: the solution to clean energy access at the BoP**

Based on 10 years’ experience of working alongside social and environmental small, medium and micro enterprises (SMMEs)\(^5\) it has become apparent that these enterprises can offer one concrete means of addressing these issues. These enterprises are specialists in understanding local challenges and needs and with their extended local networks have the ability to reach the last-mile beneficiaries. Of the 202 enterprises SEED\(^6\) has worked with, about 22% work in the energy sector ranging from solar energy, clean cook stoves and other innovations such as biogas. Based on a recent survey (Ehrensperger et al. 2015) at SEED, their businesses have directly reached over 3 million beneficiaries\(^7\) and another 1 million indirectly benefits from training and awareness raising campaigns. But how do they succeed where so many have failed so far?

By introducing new innovative products, services and models they address social needs and create new social relationships. The case of Solar Sister (Heuer et al. 2015), an eco-enterprise which operates in Uganda, Tanzania and Nigeria, provides a good example of how new innovative social structures can maximise the uptake of green energy at the BoP by incorporating a Triple Bottom Line (TBL) approach into their business model from the outset.

2. **Methodology**

Since 2002, SEED has promoted TBL solutions at grassroots level by selecting and supporting over 200 eco-enterprises in 37 countries. Through an annual award scheme, the SEED Awards identifies promising, innovative and locally-driven start-up social and environmental enterprises in countries with developing and emerging economies, which have the potential to make real improvements in poverty alleviation and environmental sustainability while contributing to a greener economy. Those SMMEs work in a wide range of sectors such as sustainable agriculture / aquaculture, biodiversity, green technologies, waste and sanitation, and energy.

In 2014-2015 SEED observed in depth a sample of those eco-enterprises to provide insights for policy and decision-makers on the role of eco-enterprises in achieving sustainable development, and on enabling factors that can help them overcome barriers and reach scale and replicate. Quantitative and qualitative interviews were conducted with over 60 enterprise owners, executives, business partners and beneficiaries in Colombia, India, Kenya, South Africa, Uganda and Viet Nam, which resulted in 12 case studies. While the enterprises operate in varying sectors and have unique products and services, they all share the common objective of introducing green innovation at the grassroots to address social, environmental and economic local problems. As a result they share similar features in their partnerships, organisational structures, business models and they experience comparable challenges. This paper discusses which innovative social structures have enhanced the uptake of green innovation at the BoP and contributed to local change through the case study of Solar Sister.

Whilst innovation may imply the development of new technology, it can also involve new ways of organising an enterprise’s supply chain in a way that is more environmentally friendly and efficient, or bringing new skills or services to people in the community (Slavova et al., 2015). In a local setting, innovation really has value when it not only generates additional profits for an enterprise, but when it helps to address local social and environmental problems. In this paper, the definition of ‘social innovation’ is in line with that of the European Commission paper (BEPA, 2011, p.33):

"*Social innovations are innovations that are social in both their ends and their means. Specifically, we define social innovations as new ideas (products, services and models) that simultaneously meet social needs (more effectively than alternatives) and create new social relationships or collaborations. They are innovations that are not only good for society but also enhance society's capacity to act.*"

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\(^5\) Also known as green and inclusive enterprises or eco-enterprises

\(^6\) Founded in 2002 by the United Nations Environment Programme (UNEP), the United Nations Development Programme (UNDP) and IUCN (International Union for Conservation of Nature). SEED strengthens the capacity of small grassroots enterprises in developing countries to enhance their social, environmental, and economic benefits, builds bridges between entrepreneurs and policy makers and stimulates exchange and partnership building.

\(^7\) Based on the replies of 29 respondents.
3. Social innovation for improved impact

Tailored last mile distribution through unique market position

A feature that social and environmental SMMEs share is their physical closeness to local markets, which provides them with a unique position to know and reach their market and to respond to changing demands from customers and the wider community (Bymolt et al, 2015).

In the case of Solar Sister, by combining solar and clean energy technology with an Avon-style direct sales network, Solar Sister is able to tailor its products for different market segments ranging from small households, businesses as well as institutions such as school and health clinics. The enterprise buys a wide range of products, consisting of simple solar lighting, lights plus mobile phone charging products and plug and play home kits, larger customised designed solar systems and efficient cook stoves, from recognised international manufacturers of innovative clean technology to ensure high quality and durability of the products. The enterprise’s strength lies then in the last mile distribution model which relies on field agents rooted in the community. Through their close relationship with the customers, the field agents have access to direct real time customer feedback from the community on what products customers particularly respond to in order to meet their unique energy needs.

This model allows high-end producers of innovative green energy solution to extend their value chain to even the most remote communities in Africa, which is generally considered one of the main challenges for producers, and tailor their products in a way that serves the specific needs of those communities.

In essence, this model addresses the huge gap in the last mile distribution to connect life-changing solar technologies to end customers, the grassroots marginalised communities and has so far reached almost 200,000 beneficiaries (Heuer, et al 2015).

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8 “Plug-and-play solar home system kits can provide power for multiple appliances, such as lights, mobile phones, TVs and fans. The systems are often sold as complete kits (solar module, charge controller/battery box, lights and appliances) that can be easily assembled” (Harper, 2015)

9 Pricing vary depending on system sizing
Linking green innovation to socio-economic empowerment

The Solar Sister field agents consist of “Solar Sister Entrepreneurs” who are local women recruited, trained and mentored by Solar Sister to set up their independent clean energy micro-enterprises. Each Entrepreneur is different; they can be a teacher, a farmer, a businesswoman, a parent, but the characteristic they all share is the knowledge of their communities, their neighbours’ needs, and of the type of products that might help them build better lives. They are provided with a full “business- in-a- bag”. The micro-entrepreneurs invest in the start-up kit of clean energy products, and receive ongoing marketing and coaching support as a value added benefit. They are able to start their businesses by starting small, i.e. buying one or two lights at first, and reinvesting that profit into buying more solar products until they can purchase in bulk. Through a micro-consignment model that minimises start-up risks and enables the Solar Sister Entrepreneurs to become successful business women without incurring high-interest loans, the enterprise offers thousands of women a chance to make a sustained living. This business model uses the women’s most valuable asset, their social network of family, friends and neighbours, and addresses the women’s lack of access to capital and low threshold for risk. As a result, the enterprise creates value for both their customers, who have access to clean and reliable energy, as well as the women who are the champions of the organisation:

“Firstly, the enterprise generates stable income10 for its 50 direct employees. Secondly, 1,196 women11 have increased their household’s income by becoming Solar Sister Entrepreneurs. With a national average household size of 5.2 in rural Uganda (Uganda Bureau of Statistics, 2009/2010), 4.9 in Tanzania (UNFPA, 2013) and 5.9 in Nigeria (Kwara State Bureau of Statistics, 2006) this new income generation opportunity directly impacts approximately 6,200 people in the three countries. In addition customers also benefit from long term financial benefits since the clean technology products reduce the costs of electricity from the grid (if available at all), paraffin wax and kerosene. Typically beneficiaries save 30% on kerosene and paraffin alone when they use solar appliances from Solar Sister” (Heuer et al, 2015).

In the broader economic context, Solar Sister also improves economic productivity, enhances business networks and expands market opportunities through competition and the generation of secondary businesses. Productivity gains are derived from the nature of the products since solar appliances save time and resources for its users; for instance while people often walk 2-3 km to charge their phones, solar chargers allow people to charge their phones at home. Finally, by encouraging entrepreneurship and providing the required skills, Solar Sister has enabled numerous Solar Sister Entrepreneurs to successfully start secondary businesses in the community, such as pig farming or making children’s iced treats (Heuer et al, 2015).

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10 Salary rates depend per country
11 728 in Uganda, 309 in Tanzania and 159 in Nigeria

Picture credit: Solar Sister
Creating local ownership for social change
Our findings show that partnerships with local municipalities, communities and civil society organisations are not only crucial for the growth of SMMEs but also invaluable in reaching social and environmental impact; for instance in this case, by gaining access to new networks at the base of the pyramid. Paramount to the process, is local engagement from the outset, including in the decision making process, so as to create ownership amongst the local communities, without which the longevity of the operations can be at risk (Slavova et al, 2015). This was particularly evident in the case of Solar Sister where strong community engagement and extensive networks are the backbone of the enterprise.

Introducing a new technology always requires much customer education and awareness creation. As the micro-entrepreneurs are rooted in their communities, they become trusted energy advisors and focal points for quality customer care. In addition, this focus on woman-to-woman sales is the best way of introducing new technology in rural households where women are the primary users and managers of household energy.

In addition, the variety of partners from different countries and cultures means that Solar Sister has to constantly work to nurture these relationships. By engaging women at the grassroots, local and cultural challenges are addressed and amicable solutions found when necessary.

At the same time, the business model is based on women entrepreneurs travelling to the customers. This means that business relationships are developed between different regions of the countries and between different, previously unconnected, segments of society. As the economic network expands, so does the knowledge of solar energy. This in turn encourages market competition for solar products (Heuer et al, 2015).

Gender empowerment
It is estimated that about a third of all formal SMEs in emerging markets are under female leadership. But women’s entrepreneurship is largely skewed towards smaller enterprises (IFC,2011). “Female entrepreneurship thus represents a vast untapped source of innovation, job creation and economic growth in the developing world” (Niethammer, 2013). For the eco-entrepreneurship sector to develop to its full potential, it is therefore crucial to enhance women’s ability to participate in SM(M)E development at all levels (OECD, 2004) and address gender specific barriers.

Solar Sister is one of the few – if not the only - organisation in the world to have built a global network of female micro-solar entrepreneurs to address energy poverty, combat climate change and advance human development. The money that both the women entrepreneurs and the (female) customers are able to earn/save from the Solar Sister products generates additional income for the household, which can be used for the children’s education, health care, clothing or food. As a result, women depend less on their husbands and beneficiaries have reported that it has led to greater respect and influence in the household decision-making process (Heuer et al, 2015).
In addition, the entrepreneurs acquire transferrable skills in sales, pricing, record-keeping, and technical knowledge about how to repair the products; skills that can be transferred into other activities. Finally they develop confidence and knowledge as they travel to new areas and extend their networks.

4. Creating more enabling ecosystems for business development in green energy

Financing the missing middle

Solar Sister, founded in October 2009, began with only 10 Solar Sister Entrepreneurs who performed so well beyond their original sales target that the enterprise was able to grow rapidly. Their strong financial performance and good partnership networks enabled them to expand beyond Uganda and they replicated in Nigeria in 2012 and in Tanzania in 2013. By early 2015 they were working with over 1,100 entrepreneurs.

In its first years, the enterprise grew out of a grant of $1,000,000 USD from USAID’s Development Innovation Ventures initiative which was used to scale up the enterprise’s network in Uganda and begin operations in Tanzania. The next year, Solar Sister received another grant from the Partnership on Women’s Entrepreneurship in Renewables (wPOWER) consisting of an additional $1,000,000 USD. This money was used for similar purposes of training and enlarging Solar Sister’s network. In 2013, a turnover of $1,195,742 USD resulted in a profit of $259,420 (Heuer et al, 2015) and 80% of their income now originates from sales. Now that operational costs can largely be funded from sales, grants are mainly required for scale up, investment in building the last mile distribution networks and training of human resources for the growing clean tech sector.

Whereas Solar Sister has been successful in scaling, securing finance is one of the most common challenges faced by social and environmental enterprises in maintaining operations and expanding so that they may have greater TBL impact. They are perceived to have a high risk profile by financial institutions as they lack the collateral and track record to give financial institutions the confidence they need to lend (Bymolt et al, 2015). At the same time these enterprises are too advanced to be considered by typical microfinance institutions. This gap in accessing finance is also referred to as the ‘Missing Middle’ (Delnoye, 2012).

The eco-enterprises in our case study sample fit this profile. Many do not meet typical requirements for loans, such as “holding assets or demonstrating other income streams that can provide security for loans or lines of credit” (Creech et al, 2012). Consequently, they mostly rely on grant support or subsidies for investments during their ‘take-off’ phase. While these financing alternatives offer a solution in the short-term to develop the business, it could be of concern for their long term financial sustainability if they are not able to access formal loans or venture capital due to a lack of lender or investor confidence (Bymolt et al, 2015). Eco-enterprises are well aware of that fact, and all cases in our sample have long term strategies in place to move away from grants dependency; mostly by adopting “hybrid” models 13. This reinforces our earlier findings of 2012 12, where over the three years’ study we witnessed a drop in the reliance on grants from being the single most important source of revenue to accounting for only 10% of the revenue stream (Creech et al, 2012). A mix of revenue sources and adopting new ways to secure loans, lines of credit and investors are therefore essential to the expansion of their operations (Creech et al, 2012).

Meanwhile it is also imperative for eco-enterprises to build a strong track record through sound impact planning and monitoring. Just like larger corporations, SMMEs need to be open and transparent about their work, reporting both positive impacts and mitigation of potential negative impacts. While eco-enterprises in our case studies report that winning an award has helped the enterprise to gain credibility with those in positions to provide financial resources (Bymolt et al, 2015), investors need to know what the social and environmental footprint of an enterprise will be before putting in funds. TBL planning and reporting is therefore an important tool for these enterprises to secure finance. Over 10 years’ experience has shown however that monitoring comes with challenges: the context differs for each sector; monitoring and understanding impacts can be an expensive and resources intensive process and often requires relatively heavy investment; causality is often difficult to establish; and measuring social and environmental impacts in specific sectors can be extremely challenging since these can be difficult to track. Eco-enterprises face additional problems, for instance aligning business development and social/environmental indicators are not easy since they look at similar issues from a different perspective; raising the awareness of customers and beneficiaries to impact measurement and making the significance of its various elements understandable is difficult; and assessing impacts is often logistically challenging since appropriate infrastructures and capacities often do not exist within enterprises. It is true that in the last decade many tools and mechanisms have been developed by various actors, however it can be challenging for SMMEs to know which tools are most appropriate for them and they are often required to use various tools by different donor/ investors, which only adds to the complexity of monitoring. In order to empower eco-enterprises and enable them to build a track record of

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12 a combination of not-for-profit and for-profit ventures where the commercial activities are strictly driven to achieve a social/ environmental mission
13 3-year study based on over 1,300 respondents
their TBL performance, it is imperative for policy makers, practitioners, donors and investors to join forces in aligning impact monitoring mechanisms and tools; addressing the ambiguity in the terms; and considering the role of ICT in making the process easier and lighter for SMMEs.

Finally, it is paramount for investors to shift their traditional understanding of performance measurement, which only takes into account the economic performance of the SMME rather than a holistic assessment of TBL impacts. It is useless for eco-entreprises to spend resources trying to capture their social, environmental and economic performance if investors do not recognise the value of those impacts. In this light, the recent growth of the ‘impact investment’ sector could have great potential for eco-entreprises. They are more willing to accept a degree of financial risk, or lower financial returns on an investment because they recognise the wider social and environmental impacts that can be realised through the investment (Bymolt et al, 2015). However the field of impact investment is still relatively nascent and reports, for instance from The Monitor Institute and the Acumen Fund (Koh H et al, 2012), warn that impact investment should be considered as a complement rather than a replacement to traditional sources of funding.

Multi-stakeholder partnerships: increase networks and expertise
Multi-stakeholder partnerships are vital for harnessing knowledge and inter-organisational learning, for pooling resources and capabilities, for navigating bureaucracy and accessing finance, and for promoting the enterprise’s added value to customers, donors and the wider community (Bymolt, et al 2015). Partners offering technical support help to build the capacity of the enterprises, as well as its workers through training, and can be crucial to both the development of strategy and products. In many emerging economies incubator hubs that have become popular with start-ups and SMMEs in Europe and the US do not exist and so it is crucial for eco-entreprises to develop their own support networks (Bymolt et al, 2015). Indeed, our latest research shows that partnerships with commercial, public sector, local and community organisations and the social capital mobilised through them, were a direct enabler of business sustainability as well as of social impact. We have identified some trends as to the specific needs each type of partnership addresses:

- **Partnerships with research institutions** offer opportunities for eco-entreprises to develop an innovative product or service based on scientific basis and helps them test or validate that. They also help to demonstrate the viability of a product to potential investors and fast-track its development into the marketplace (Creech et all, 2012).
- **Partnerships with dedicated government departments** can provide support for instance in creating market linkages; however they could prove obstacles to forming partnerships with additional government bodies (Slavova et al, 2015).
- **Partnerships with commercial businesses** are primarily formed on the basis of corporate social responsibility, rather than on the basis of strict business interest.
- **Partnerships with public sector organisations** such as provincial governments and public agencies contribute considerably to the provision of support services to the enterprises, primarily by providing technical input to the small enterprises.
- **Partnerships with civil society organisation** are critical in accessing grassroots networks.

In the case of Solar Sister, the enterprise has built a strong network with over 100 partners by creating grassroots linkages and institutional relationships with NGOs and businesses. A few are particularly relevant (Heuer et al, 2015):

- **Mothers’ Union of Uganda** offers access to networks of women’s groups. In turn the Mother’s Union uses the partnership to give its members income generation opportunities.
- **The African Wildlife Foundation (AWF)** is an environmental conservation organisation which has assisted Solar Sister’s expansion on the ground in Tanzania by providing access to networks in Tanzania, but also by offering office space in their Tanzanian headquarters. In turn AWF members have an opportunity to generate income as Solar Sister Entrepreneurs.
- **d.light, Greenlight Planet, Barefoot Power, Bboxx** provide a range of solar products, and Envirofit and **International Lifeline Fund** make products available in the clean cooking space. Through these various partners, Solar Sister has access to a wide range of high quality clean energy products that they can tailor to the communities needs and the tech partners benefit from Solar Sister’s
last mile reach and real time feedback on the type of products customers particularly respond to.

A clear condition for those partnerships to work is the necessity for mutual benefits for each partner, strong communication, and clearly defined roles (Slavova et al, 2015 & Heuer et al, 2015). Yet, for partnerships to further support the scale up of the green energy sector, more insights are needed into the barriers and success factors of such partnerships and into ways in which policies, regulatory frameworks, and markets can facilitate partnership development in future.

5. Conclusion and recommendation for the future

There is no ‘one-size-fits-all’ solution to clean energy distribution or adoption but interestingly eco-entrepreneurship provides ways is which innovative products can be introduced and absorbed at a large scale whereby distribution models and product lines are tailored to the specific needs of their customer groups. In the case of Solar Sister in Uganda, Tanzania and Nigeria, where there is a high demand for energy in deprived areas, the enterprise offers a wide range of high quality clean energy products with a long life-cycle, and has created an innovative value chain where benefits are derived throughout the entire chain, which works in particular for those at the base of the pyramid, and which addresses persistent social needs.

The social innovation that undoubtedly allowed the successful and long term uptake of the innovative green technologies at the grassroots, where others have often failed so far, is the creation of a unique women-to-women network rooted in the community. Women are the primary users and managers of the products that are being introduced, i.e. household energy, and by working closely with the Solar Sister Entrepreneurs - women rooted in the communities - Solar Sister’s model uses the women’s most valuable asset: their social network of family, friends and neighbours. The Solar Sister Entrepreneurs are trusted by the other women in those communities and they understand best the challenges and needs of those women. As a result, they become trusted energy advisors. In addition, as the micro-entrepreneurs receive technical training, they are able to provide direct quality customer care and are able to repair the products. By addressing the women’s lack of access to capital in combination with creating local trust and ownership, the enterprise has reached last-mile customers at a large scale and the tailored after sales customer support ensures that the products are used in the long term. By positioning themselves close to their markets, the enterprise is also able to tailor the products to specifically address the local needs, which can vary strongly per region. In doing so, the life-changing green technologies are actually useful to a wide range of grassroots consumers.

Furthermore, the introduction of new technology can often be costly. The enterprise instead has managed to turn those products into a means to save costs at household level and into a source of income for the micro-entrepreneurs. In marginalised areas where employment and income are low, this added economic value forms an additional incentive to take up the technology and for more women to become micro-entrepreneurs.

In essence, it is clear that eco-entrepreneurship has a significant role to play in the development and uptake of green energy at a large scale; but the strong engagement of women - the main end customers – and the creation of women-to-women networks throughout the value chain and the decision making process, are vital for the absorption of green technology at the grassroots and insure the long term usage of those technologies.

For the green energy sector to develop to its full potential, it is now imperative to create supporting ecosystems that will enable current eco-enterprises in the green energy sector to thrive; stimulate others, especially women, to take up eco-entrepreneurship in green energy; and increase the money-flow to SMMEs in the green energy sector as channel for green growth. This can only be achieved by further researching and mapping:

- the most significant challenges facing the green energy sector;
- gender specific barriers in the access to green energy;
- areas of green energy solutions that are emerging; and
- the business climate (especially for women entrepreneurs) for green energy.

This paper has highlighted some of most systemic challenges experienced by SMMEs working in the green energy sector, such as financing, lack of awareness from communities and governments, lack of technical support and most importantly gender inequality. To address those, governments, practitioners, investors, donors and academics need to join forces and consider how policies, regulatory frameworks, and markets need to be reformed in order to stimulate women empowerment and multi-stakeholder partnerships; promote the value of TBL approaches with customers, governments and investors; help financial institutions in developing new approaches of providing financial resources; and improve TBL planning and monitoring processes.
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