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Decision Support Unit (DSU)

Renewable Energy Sector Study

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About the Decision Support Unit (DSU)

The DSU is a Foreign Commonwealth and Development (FCDO) -financed project implemented by Oxford Policy Management (OPM) in the Democratic Republic of Congo (DRC). It is designed as a support function to FCDO’s overall management of its Private Sector Development (PSD) programme. The DSU provides evidence and analysis aimed ultimately at improving the programme’s overall impact of increasing incomes for the poor in the DRC. In addition, the DSU provides an external learning role targeting improved implementation practices of the broader development community working in the field of economic development.

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List of abbreviations

AAER	Adopt-adapt-expand-respond
ACERD	Association Congolaise pour les Énergies Renouvelables et Décentralisées
ANAPI	L'Agence Nationale pour la Promotion des Investissements, Ministère du Plan
ANSER	Agence Nationale de Service Energétique Rural / National Agency for Rural Energy Services
ARE	Electricity Regulatory Authority
CDC	Commonwealth Development Corporation, the UK's development finance institution
DRC	Democratic Republic of Congo
DSU	Decision Support Unit (FCDO DRC PSD Programme)
FGD	Focus group discussion
FMO	Dutch Entrepreneurial Development Bank
GDP	Gross Domestic Product
GiZ	Deutsche Gesellschaft fur Internationale Zusammenarbeit
GLP	Greenlight Planet
GOGLA	Global association for the off-grid solar energy industry
ICS	Improved Cook Stoves
IEA	International Energy Agency
IFC	International Finance Corporation, part of the World Bank Group
IPP	Independent Power Producer
MSC	Market System Change
MSD	Market systems development approach
NAIC	Net Attributable Income Change
OCC	Congolese Control Office, Ministry of Commerce.
PayGo	Pay as you Go
PCR	Élan's Project Completion Report
PPP	Public private partnership or Purchasing Power Parity
PPPD	Per person per day
PSD	Private Sector Development
PWIG	(Élan's) Project Wide Implementation Guide
SHS	Solar home system
SME	Small and Medium Enterprise
SNEL	Société Nationale d'Électricité

ToC	Theory of Change
UCM	Unité de Coordination et de Management / Coordination Management Unit, Ministry of Energy and Hydraulic Resources
UNCDF	United Nations Capital Development Fund
UNDP	United Nations Development Programme
USAID	United States Agency for International Development
USD	United States Dollars
WB	World Bank
WP	Watt Peak

Executive summary

Introduction

This report documents the evaluation of Élan's work in the renewable energy sub-sectors of pico solar and improved cookstoves (ICS) in the Democratic Republic of Congo between 2015 and 2021. Élan is part of the Foreign, Commonwealth and Development Office's Private Sector Development (PSD) Programme.

Élan aims to facilitate the growth of more inclusive markets in targeted sectors: pico solar, solar home systems and improved cook stoves. The purpose of the study is to examine the extent to which market system changes were achieved and sustained, and led to wider impacts beyond the businesses and organisations with which Élan directly engaged and supported. The underlying factors constraining the sectors' development are complex, as are the pathways to making the market more inclusive. This study has sought to understand and interpret this complexity to inform FCDO future programming.

This executive summary, first, provides an overall summary and conclusion and, secondly, encapsulates the key findings for each evaluation question. The main body of the report provides the detailed findings. Due to limitations faced in conducting this study, most of the findings and conclusions relate to the solar sector rather than cookstoves.

Overall summary and conclusion

Between 2014 and 2021, Élan spent approximately £1.5m on renewable energy sector interventions, excluding market analysis, non-partnership activities and overhead expenses.[1] Including these indirect costs, total spending on the Renewable Energy sector over the course of Élan's implementation could be estimated to be in the region of £11m.

Élan secured £2.3m co-funding from businesses. Local businesses in the solar sector contributed proportionately more than those in the ICS sector, or international businesses. International businesses required more incentives to work in DRC and/or serve the poor.

There have been small incremental, but important, improvements in the market. However, large numbers of poor are yet to benefit, and the sustainability of changes has not been fully tested.

The changes have, however, occurred despite little change in the overall political and economic context that hinders more inclusive economic growth. Élan contributed to increased disposable incomes for around 153,000 people, of which it is estimated 46% were extremely poor (living below $1.90 PPP per person per day (pppd)) and 24% poor (living below $3.20 PPP pppd). About 10% of customers used products to generate additional income. More customers likely benefited from lifestyle improvements than

[1] Overall Élan spending for 2014-2021 was approximately £44m (£38m Élan 1.0, £6m Élan 1.2). Pre-implementation spending in 2012-2014 was about £8m, bringing total project spend to £52m. Élan's budget reporting only directly attributes part of the spending to the individual sectors that Élan worked on, with the remainder being cross-cutting. For Élan 1.0 the Renewable Energy sector represented 21% of Élan's attributable sector spending (the remainder was for Agriculture, Access to Finance and Transport). This proportion rose to 28% in Élan 1.2. As such, overall project spending on the Renewable Energy sector, including the attribution of indirect cross-cutting spending, was in the region of £11m.

financially. Élan's assumptions about the financial benefits for poor consumers were over-optimistic. However, income generating opportunities have been created for some groups, but workers are more likely to be middle-income, not poor.

Élan was fundamental to the establishment of the renewable energy industry association, which it saw as the vehicle to lobby for reduced taxes on renewable energy products. Tangible policy outcomes have yet to be achieved. The government has not reduced the high taxes but instead provided individual tax exemptions to a small number of businesses giving them a competitive advantage.

Quality pico solar and solar home systems are more available in urban centres and densely populated areas in DRC. Élan facilitated new relationships between international manufacturers and suppliers of quality-verified products and local importers and distributors, and sales have gradually increased. The sector shows some resilience to shocks as some businesses did not experience a drop in consumer demand and sales due to the coronavirus pandemic. Only some of Élan's partners (businesses) continue to sell products affordable to poor consumers (less than $30). Direct sales distribution models, introduced to local businesses by Élan, have been effective in increasing sales but are costly. This, together with lower profits on smaller products, provides less incentive for businesses to serve poor consumers. Lower quality products are still more affordable and accessible to the poor than quality-verified products.

Many businesses receive some subsidised support from donors, so the viability of their business models is not yet fully tested. Lack of access to local finance remains a barrier to local businesses' growth and adoption of new business. Élan was unable to find solutions that met local banks' risk appetite or convinced them of the financial return. However, consumers who meet credit criteria have increased access to credit, via renewable energy businesses using Pay as you Go (PayGo) technology. Credit is mainly provided for solar home systems, which are not affordable to most poor.

Élan's knowledge of the market and actors grew through its experience. FCDO's future programming should draw on this knowledge and lessons. The renewable energy market remains at an early stage of development and over the next 5-10 years much of the population will still only be able to afford lower quality pico solar. Affordability is the most pressing constraint on their mindset and decisions about energy access.

There is neither compelling economic or environmental rationales for support that serves the needs of upper-middle and higher-income consumers who can afford products.

Future FCDO programming should focus on:

- **reducing the high taxes** on renewable energy products to reduce prices for poor households and, thereby, increase their net income. This may include additional support to ACERD.
- **innovations to reduce charcoal use** and reduce deforestation.
- **the potential of mini-grid**, following on from Essor's initiatives, **and** more effectively using DRC's **hydro resources** in the longer term. This is to reach beyond the household focus.

Specific activities could include:

- **developing the market for products with more income generating potential**, e.g. cold storage and water pumps since Élan's assumption about the income generating potential of pico solar (and solar home systems) has not held.
- **Re-examining the current focus on quality-verified products** since lower quality products will still be more affordable to large numbers of poor consumers.
- **Ongoing market monitoring** particularly around sustainability of inclusive business models, credit interest rates and indebtedness.

The programme delivery service provider should also have the flexibility to work with government, businesses, and other actors as necessary to address market constraints.

The remainder of this executive summary focuses on key findings for each evaluation question.

A2: To what extent was Élan and the interventions it supported appropriately designed to meet the needs of stakeholders and target beneficiaries?

The design of Élan's interventions was partially appropriate to the needs of stakeholders and target beneficiaries.

Élan's target beneficiaries were poor men and women in urban centres and densely populated zones of DRC without access to affordable and reliable energy. To meet their needs, Élan's studies found there was a market for:

- Pico solar lanterns sold to the consumer for $20 - $30
- Improved cookstoves sold for $20

While products within these price ranges were already being sold, they were mostly low quality. Élan identified an opportunity to better meet the needs of target beneficiaries (poor consumers) and increase the availability of quality pico solar and ICS products onto DRC markets. Élan identified and developed a diverse range of business stakeholders required to bring these quality products to DRC markets. These included:

- **Increasing the number of local businesses providing affordable quality products**: a) import and distribute quality verified pico solar products; b) manufacture and distribute improved quality cookstoves and c) provide consumer credit including through the "PayGo" model. These interventions were partially successfully although some businesses did not find all aspects of introduced models appropriate to their situations, and some have since stopped focussing on poor consumers because of lower profitability.
- **Facilitating the entry to DRC of international businesses** to increase the scale of product distribution of reach to poor consumers. This also contributed to increase the scale of sales of solar products (but not cookstoves), including expanding availability to new locations. However, some business left the DRC market after Élan support finished.
- **Supporting banks and financial institutions** to provide credit to (a) poor consumers and (b) businesses. These interventions were not successful, and it is unclear as to why but possibly the interventions did not adequately address banks' attitudes and policies related to credit risk.

In conclusion, Élan's interventions have mostly succeeded in increasing sales of quality products (solar more than ICS) which has benefitted business and some consumers, but not necessarily the poor as products remained unaffordable.

A3: To what extent did the intervention logic and assumptions of the Élan project (and its interventions) hold during implementation?

Most assumptions have partially held true. Most critically, the affordability of pico solar products for poor consumers and businesses' interest and ability to serve this market profitability is still being tested. Customer demand has also yet to be fully tested.

Additionally, while the use of these products has reduced energy expenditures for some customers, increased disposable income is largely not used for income generating purposes. Therefore, these products do no foster economic opportunities for most poor people, which is the intended outcome of the PSD programme.

Assumptions regarding businesses adopting new practices and expanding to new locations has held true but not all have maintained these changes. This is because while Élan successfully incentivised businesses to serve low income customers, not all of them continue to do so.

Assumptions relating to local banks providing access to finance for businesses and consumers have not held true.

B2: To what extent has Élan led to improvements in market systems?

Overall, there have been small improvements in the market system for pico solar resulting in financial and non-financial benefits to target groups, **but the key constraints remain largely unchanged and large numbers of poor people are yet to benefit.** It is more profitable for businesses to sell larger products, such as solar home systems, than pico solar. This risks a roll-back on the small gains that have been made. Already, some of Élan's partners are no longer serving poor customers, but rather focusing on the other consumer segments such as middle income.

In 2015, Élan identified the following constraints to poor consumers access to affordable energy:

- Unfavourable overall business environment
- High taxes on renewable products
- Consumers lacked awareness of renewable energy products.
- Businesses and consumers lacked access to credit

The status of these constraints is outlined below.

There has been little change in the overall policy environment for small renewable energy products. While the government's rhetoric has increased, it is yet to be followed by substantive action.

High taxes on renewable products have largely not changed. Élan has successfully supported the establishment of the industry association, ACERD, with the objective of reducing taxes. A few businesses have obtained individual tax exemptions creating an uneven playing field. This is a negative change that may

decrease the incentive for businesses to share cost savings with other market actors, particularly consumers. Building trust across members in the association is still a work in progress.

Consumers' awareness of the benefits of quality verified solar products is increasing but remains low. There is greater awareness in urban centres, which is where most businesses' distribution channels reach. Élan strengthened some businesses' marketing capacity, although the effectiveness of the national campaigns it supported was low. Even though poor consumers' purchasing power is low, most would prefer products larger than single lanterns since they offer more convenience.

Élan helped connect local importers and distributors to international manufacturers and suppliers of quality-verified products and vice versa. Businesses adopted new business and/or distribution models with Élan's support and post-Élan support they have adapted these models to increase viability and profitability. Most businesses see poor consumers as potential customers, rather than the extremely poor who they believe cannot afford quality products.

Beyond the initial pilots, most businesses have continued to invest in inventory and some in marketing. Some businesses are now marketing and distributing products under their own brand, a change that could signal a deeper investment in their own business. Changes in distribution models have created new employment and income generating opportunities, although for men and women who are unlikely to be poor. Not all the opportunities created have been maintained as businesses have sought to reduce some staff related costs.

Additionally, some businesses are now selling certified products that are cheaper than the Lighting Global quality verified products, thereby creating another tier in the market and providing consumers more choice matched to their purchasing power. Élan does not appear to have anticipated these changes, but they reflect those also happening in other countries.

Businesses hold most of the power in the business-consumer relationship in the DRC. Sales data indicates that the number of connections between businesses and consumers are increasing. The volume of sales of quality verified pico solar and solar home systems products has increased since Élan commenced, much more so than for ICS. Élan has worked with many businesses in DRC currently selling pico solar products and has been influential in the growth in sales. Businesses selling quality-verified products are concerned about high competition from low-quality products. The development and enforcement of standards would benefit businesses but decrease poor consumers' access to more affordable, albeit poor quality, products.

There have been limited improvements in access to finance for some businesses, but most are underpinned by concessional finance and support from donors, rather than fully private finance that might indicate more financially sustainable business models. Local banks remain risk adverse and have high collateral requirements when lending to businesses; and few, if any, manufacturers are providing credit to importers and distributors. Élan's efforts were not successful. A very small number of businesses have received international investment to support their growth in DRC. Much of this investment is underpinned by claiming contribution to improving 'access to affordable,

reliable, sustainable and modern energy for all' (SDG7), rather than a more specific focus on Élan's target group. Élan's partners receive financial and non-financial support from multiple sources, making it difficult to understand Élan's contribution. Élan more likely contributed to investment raised by local businesses who improved their management due to the programme's support while improvements in international businesses is less likely.

Renewable energy companies are the key credit provider since Élan was unable to influence local banks to develop new loan products. Élan supported the adoption of PayGo by one local business, but could not convince another four to adopt the model. Consumers' choice in credit providers remains low, but this may change if more PayGo operators enter the market. However, it is the less poor that mostly benefit from this change. Current interest rates are estimated to be similar to microfinance rates. Customers could potentially benefit more in the long term from PayGo models if their credit history was able to be used to access credit. However, there are numerous challenges to be addressed before this benefit could materialise.

B3: What factors have influenced the results achieved?

The political and economic environment in DRC make doing business challenging, and more challenging to focus on a consumer segment with limited purchasing power.

It is difficult to sell quality verified lanterns to the target group profitably. Élan has successfully influenced some changes in business practices, providing knowledge of business models and business to business introductions for manufacturers, importers and distributors. Élan also shared its improving sector knowledge to influence practices. Several businesses have continued with practices and relationships, albeit with adaptions to increase profits while managing risks. These adaptions have continued to benefit middle income consumers, but not necessarily the poor.

Élan's work with banks and financial institutions to provide finance to businesses and consumers has not been successful, largely because interventions do not seem to have adequately understood and addressed underlying barriers to change. Élan has been more successful, although still very limited, in improving consumers' access to finance through its support to one international PayGo operator and one local business to adopt PayGo.

Élan's indirect approach to tackle the constraint of high taxes was influenced by the mandate of its sister programme, Essor, who worked on business environment issues and a rationale that if Élan worked with government it would not be seen as a credible partner by businesses.

A range of other factors have affected results, most recently the coronavirus pandemic, which have slowed some sales but not stopped them. Élan 1.2 redirected resources towards humanitarian-style interventions that did not contribute to market development and capitalise on investments and progress made in previous years.

Some elements of Élan's programme design, and the structure and mandates of programmes under the PSD programme, impacted results. This includes the segregation within FCDO's private sector development programme of business environment reform and market systems development; and the emphasis given to

beneficiary impact indicators as the predominant sign of Élan's success over market systems change. **Uncertainty over the programme's future and changes in FCDO's direction also disrupted progress.**

Given the constraints in the market and the maturity of the market, some of Élan's assumptions about change pathways and the speed of change seem implausible. Élan has not always used lessons to improve its support. For instance, Élan 1.2 staff agreed with the findings that consumer education is crucial for adoption of solar products, but Élan did not support better quality mass campaigns.

D1: What improvements in income delivered to target beneficiaries, contribution to poverty reduction, and any additional or unplanned impact can be attributed to Élan?

Most customers benefit financially or in improved lifestyle due to buying pico solar and ICS. However, savings are small and are generally not used for income generating activities.

Between 2014 – 2021, Élan's energy interventions contributed to increased disposable incomes for around 153,000 people (from spending less on energy rather than greater income generation). Over Élan's full implementation period it is estimated that 46% below the $1.90 pppd poverty line and a further 24% below the $3.20 per person per day (pppd) poverty line..

Between 50 – 70% of customers increase their disposable income by using pico solar and solar home system (SHS) products. Savings as a proportion of household income are small, and may only be around 2%. Only 10% of customers use savings to generate more income.

Some customers do not save on energy costs, testing Élan's assumption, as customers often use multiple energy sources. For instance, some customers use solar to supplement their unreliable electricity from grids. Poor customers with ICS products halved their expenditure on charcoal. At least as important as increased disposable income, solar products have delivered benefits to customers' well-being, which cannot be easily quantified. This includes: households being able to cook, eat and talk around the dinner table whenever they want; households having back-up power for use during power outages (for those with a grid connection or a generator); women having less daily work because ICS save four or five hours.

While much of Élan's attention in the sector has been on consumers, benefits have materialised for employees, contractors and others who have new or increased income generating opportunities. Businesses have created new jobs, trained staff and there are some anecdotal signs of competition for staff in the sector although these beneficiaries are outside of FCDO's target group and unlikely to be poor.

D2: What factors influenced the impact?

The breadth of impact or number of poor and people benefitting is affected by the degree to which market changes have materialised and the extent to which key constraints have been addressed. As these are so far mostly small, then this effects the number of poor people benefiting.

It is also more profitable for businesses to sell solar home systems to middle income and rich consumers, and some businesses that Élan partnered with have stopped selling or focusing on consumer that are the poorer.

Élan's assumptions about benefits, and contribution to economic growth via savings used for income generating activities, has not held. The depth and duration of impact is affected by the characteristics of the product, who uses them and how they are used. However, solar products do appear, at least anecdotally, to contribute to improved living conditions. Therefore, this may be a more appropriate measure of success. Recent research elsewhere in the region has also tested assumptions about the benefits of pico solar and is similar to Élan's experience.

E1: To what extent have the results of Élan in terms of market systems change been sustained?

The market is still at an early stage of development, and it is too early to make conclusions about the sustainability of some of the changes that have taken place. Élan's support to most partners did not continue into Élan 1.2, and the coronavirus pandemic disrupted some plans to further strengthen sustainability. Therefore, many partners have had to continue without support or with the support of other donors and programmes. While businesses largely seem to have endured shock of Covid-19, it may put increased pressure on the market's responsiveness to the poor since products affordable to the less poor have higher profit margins.

The prevalence of donor support in the sector also makes it challenging to fully understand what unaided market changes are, and how much change is unaided and therefore has perhaps a stronger foundation for sustainability.

What are the implications for FCDO's future programming that may include the renewable energy sector in DRC?

Over FCDO's next programme period of five – ten years, much of the population will still only be able to afford lower quality pico solar. Affordability is the most pressing constraint on their mindset and decisions about energy access.

There is neither compelling economic or environmental rationales for support that serves the needs of upper-middle and higher-income consumers. They can afford products, and since their use of solar supplements their existing access to the grid the clean energy and environmental impacts is also limited.

The two market changes that could have the greatest effect on decentralised energy access for poor consumers are: 1) removing import tariffs for renewable energy products; and 2) reducing charcoal use. Beyond households, the Essor programme is currently piloting mini-grid solutions using a public private partnership approach. The results of this will become clearer in the coming year. Additionally, a more centralised approach, DRC making effective use of its remarkable hydro resource endowment, is a sensible longer-term opportunity.

Based on the analysis we have identified a range of short – long term initiatives to support the renewable energy sector and build on progress to date. Future support should cover all types of market system changes from policy to mental models under the banner of the same implementing organisation to provide more flexibility to address constraints.

Area of support	Timeframe
High taxes on renewable products	Short term: now – 2 years
ACERD's capabilities	Short term: now – 2 years
ANSER, ARE, UCM	Short – medium term
Development of market for solar products that contributes more to income generating activities	Medium to long term 3 – 10 years
Low quality vs quality verified products	Short term
Pico solar and SHS market system change monitoring	Short term
Research on ICS, or alternatives, adoption rates	Medium – long term

We have been unable to collect sufficient information on what other actors are doing in the sector and key informants were unable to provide information in gaps in support. Ongoing monitoring by FCDO and further consultations are necessary to understand programming gaps. The USAID and World Bank appear to have the greatest investment in the sector in DRC.

1 Introduction

This report documents the evaluation of Élan's work in the renewable energy sector, specifically pico solar, solar home systems and improved cookstoves (ICS), in the Democratic Republic of Congo between 2015 and 2021. Élan is part of the Foreign, Commonwealth and Development Office's Private Sector Development (PSD) Program, of which the other major component is the Essor program.

Élan aims to facilitate the growth of more inclusive markets in targeted sectors. The purpose of the study is to examine the extent to which market system changes were achieved and sustained, potentially leading to wider impact beyond the businesses and organisations with which Élan directly engaged and supported. The evaluation will contribute to the overall evaluation of Élan, whose design is outlined in the Final Evaluation Design Paper that was revised in 2020.

This study traces the logical pathways between Élan's activities and the market system changes (expected and unexpected) up to the end of Élan's support and testing the likelihood of further changes to 2023, which is the final year of the PSD programme. While there are challenges of attributing market system changes to Élan, the aim was to determine evidence of plausible contributions to change. The underlying factors constraining the sectors' development are complex, as are the pathways to making the market more inclusive. This study has sought to understand and interpret this complexity.

The evaluation was completed between March and August 2021, with field work completed in May and June 2021.

The **structure of this report** follows the sequence of the evaluation questions. In order to answer each evaluation question, there is some repetition of information across sections. However, we have cross-referenced sections to minimise repetition and improve the report's readability.

The **Introduction** (this section) introducing the study includes the evaluation questions, a summary of the methodology and its limitations.

Section 2 outlines Élan's theory of change, both the original and revised versions and summarises key changes. It also briefly explains the status of the sector at the time Élan's interventions commenced.

Section 3 looks at the relevance of Élan's work to address the key constraints and meet the needs of target beneficiaries and stakeholders together. It also examines the assumptions underpinning Élan's TOC and the extent to which they held true. It draws on findings from Section 4 – 6.

Section 4 presents the findings related to market system changes. It breaks down the changes into policy, practices, resource flows, relationships and connections, power dynamics and mental models; as well as assessing changes in each of the market constraints that Élan focused on.

Section 5 examines the impact on target beneficiaries and analyses the breadth and depth of impact compared to the market size and income levels of customer segments; and also the factors affecting the results achieved.

Section 6 draws on the findings to consider the sustainability of the market system changes and impacts for beneficiaries.

Lastly, **Section 7** looks to FCDO's future programming and drawing on findings and key lessons to propose possible areas of work, building on the successes and lessons from working in the renewable energy sector over the last seven years.

1.1 Evaluation questions

The first seven evaluation questions are a sub-set of questions for the final PSD programme evaluation, planned for 2022. The last was added to this study in April 2021.

Relevance:

A2: To what extent was Élan and the interventions it supported appropriately designed to meet the needs of stakeholders and target beneficiaries?

A3: To what extent did the intervention logic and assumptions of the Élan project (and its interventions) hold during implementation?

Effectiveness:

B2: To what extent has Élan led to improvements in market systems?

B3: What factors have influenced the results achieved?

Impact:

D1: What improvements in income delivered to target beneficiaries, contribution to poverty reduction, and any additional or unplanned impact can be attributed to Élan?

D2: What factors influenced the impact?

Sustainability:

E1: To what extent have the results of Élan in terms of market systems change been sustained?

Future FCDO programming:

What are the implications for FCDO's future programming that may include the renewable energy sector in DRC?

The evaluation question matrix, including sub-questions, is found in **Annex 1.**

1.2 Methodology

The study aims to assess the extent to which the performance of market systems in the sector has been changed due to Élan's interventions.

The study was planned to be conducted in three phases – data collection, analysis and reporting (see the Élan Sector Study Framework for more detail). Changes were made in response to events leading up to and occurring during the study. The phases and changes are described below in Section 1.2.1 as are the limitations (Section 1.2.2).

The study also differentiates between increased income for target beneficiaries and market system change and, since the former may help to detect system changes, but it may not be sufficient to signal substantive changes that make the market more inclusive in a sustainable way. Due to the importance of this distinction, a conceptual framework

was developed to guide the analysis. This is summarised in Section 1.2.3, with additional information in Annex 4 on how we understand market systems change.

1.2.1 Data collection, analysis and reporting phases

Preparation phase: Élan documents were reviewed to identify key informants, and a meeting held with Élan to secure contact details and further guidance on the best way to contact informants. Élan, helpfully, sent introduction emails to their partners and key stakeholders informing them of the study, it's purpose and encouraging their contribution.

Phase 1: secondary document review and analysis and field trip logistics was completed between April – May 2021 and included a review of sector level documentation and preliminary analysis to inform the data collection during the field trip, and preparation of interview and focus group discussion guides.

Interviews with Élan staff were planned for Phase 1 but due to the availability of team members some interviews were conducted during Phase 2. Some adjustments were made in the early stages of the implementation of the study due to changes to the available budget. These changes led to a reduction in the number of questions; a shortening of time in the field; the inclusion of an additional question related to FCDO programming; and excluding the deeper examination of a small number of interventions.

Prior to the field work commencing, Mount Nyiragongo on the outskirts of Goma erupted and the planned visit to Goma was subsequently cancelled following an assessment of the situation to ensure the safety of the team and potential interviewees. See Phase 2 for further details.

Phase 2: Field data collection, overall analysis, synthesis and reporting was completed between May and August 2021.

In total, 36 interviews were undertaken[2]. Eight key informants were Élan team members while the remainder spanned the supply chain from manufacturers through to customers. Most key informants related to the solar market rather than improved cookstoves. Annex 2 lists the persons consulted for this study.

Some key informant interviews were completed remotely before the in-country field visit commenced. Due to the volcanic eruption, interviews with Goma-based key informants were completed remotely. Focus group discussions with customers of two Élan partners had been planned for Lubumbashi and Goma, which were two of the areas Élan worked in. Élan 1.2 did not work in Lubumbashi, but the location was selected to examine the sustainability of Élan 1.0 interventions. The Lubumbashi FGDs were cancelled as further discussions with the business revealed that they did not have customer contact details. Considering this situation, interviews were completed with resellers and technicians, as well as other market actors, in Lubumbashi which provided useful information on market system changes. FGDs planned for Goma were cancelled due to the eruption, and planning for FGDs shifted to Kinshasa. A subsequent escalation of Covid-19 cases in Kinshasa meant that FGDs could not be completed safely, for team and interviewees. Consequently, a small number of individual telephone interviews were completed with

[2] In some cases, more than one interview was conducted with individuals.

customers. We also collected data from three shops selling pico solar products that were not associated with Élan's partners.

1.2.2 Limitations

Several limitations were envisaged and events during the study saw some risks materialise. Most were partially mitigated by securing interviews with alternative key informants, e.g. sales agents and retailers who were not part of Élan's partners' networks.

The main limitations relate to the breadth and depth of evidence that could be collected, and the impact on some triangulation and analysis. Key limitations are:

- The limited geographic coverage of the field work reduced the ability to draw insights related to differences across geographic locations.
- Interviews could not be obtained with key government informants from Unité de Coordination et de Management (UCM) at the Ministry of Energy and Hydraulic Resources, National Investment Promotion Agency (ANAPI), Electricity Regulatory Authority (ARE), National Agency for Rural Electricity Services (ANSER) or the Congolese Control Office's (OCC) at the Ministry of Commerce. Requests for interview were unanswered or identifying the key contact person was problematic.
- We were unable to collect data from as many pico solar and SHS customers as planned, and therefore the sector study relies more heavily on data collected from customers by Élan over the two phases. Recent studies conducted during 2020 and 2021 are also limited to customers of one business, and therefore not representative of all customers.
- There was limited programme documentation for some Élan 1.0 partnerships and activities not included in partnership agreements with businesses, particularly related to access to finance activities for businesses and consumers. We have not been able to fully understand the activities completed, progress, factors affecting progress and lessons to guide future programming decisions.
- The data collected and analysed largely focuses on the solar sector, rather than improved cook stoves. Élan's investment was higher in solar than ICS, and Élan 1.2 did not invest in ICS interventions[3]. Access to information (programme documentation and key informants) was more difficult than in the solar sector. We have noted limitations regarding the improved cookstove sector in relevant sections of the report.
- We were not able to collect information some sub-questions on FCDO future programming. This was due to the difficulty in securing interviews with appropriate key informants, key informants not responding to requests for additional information, and websites that did not include up-to-date information. We secured interviews with Power Africa (USAID), GiZ and UNCDF. We did not secure interviews with the International Finance Corporation (IFC), the United States Agency for International Development (USAID), and the World Bank.

[3] There was one planned intervention that incurred some small expenditure, but we understand this did not proceed.

1.2.3 Market systems change conceptual framework

While there are several definitions of market systems change, they all seek to articulate how markets perform or behave which results in more poor and marginalised people and communities participating in markets and sustainably benefiting more from their participation. Market system change and systemic change are often used synonymously. The latter captures the notion that changes in the system need to be significant so that many more marginalised people are benefiting more from market activities. There are elements of breadth, depth, and timing.

The study aimed to:

1. Define the boundaries of the market system using the Élan sector strategies and interventions:
2. Categorise evidence of the different types of market changes that are sought to help understand the significance of changes.
3. Provide insights into the scale of the change, that is evidence of the breadth and depth of the change compared to the total scale of change that might be reasonable given the context and timeframe.
4. Examine the depth and the breadth of market changes to provide some insights into the likely sustainability of the changes.
5. Collect evidence to understand the extent to which the targeted underlying market constraints (rules and functions) have changed, Élan's influence on these changes and what this has meant for changes to the system.

To aid these steps, we developed three evaluation rubrics that contain three sets of criteria (left hand column in the tables below) and five scales of change from beginning to significant (top row in the tables below). The criteria for each rubric are:

1. Market systems changes (see Box 1).
2. Targeted constraints.
3. Outcomes for targeted marginalised groups.

Box 1: Types of market changes

Policies: government, institutional and organisational rules, regulations, and priorities that guide the entity's own and others' actions.

Practices: activities of institutions, coalitions, networks, and other entities targeted to improving social and environmental progress. Also, within the entity, the procedures, guidelines, or informal shared habits that comprise their work.

Resource flows: How money, people, knowledge, information, and other assets such as infrastructure are allocated and distributed.

Relationships and connections: quality of connections and communication occurring among actors in the system, especially among those with differing histories and view points.

Power dynamics: The distribution of decision-making power, authority, and both formal and informal influence among individuals and organisations.

Mental models: deeply held beliefs and assumptions and taken-for-granted ways of operating that influence how we think, what we do, and how we talk.

Table 1: Rubric: understanding types and scale of market system changes

Market changes		1) Beginning	2)	3) Strengthening	4)	5) Significant
Structural – explicit	Policies	There is no or little awareness of the need for or benefits of a rule change. Or there are no active efforts to achieve a rule change.	There is some awareness of the need for or benefits of a rule change and some early efforts by a limited number of actors to achieve a rule change.	Desire for an inclusive rule change has begun to increase and various proposals are being discussed.	Notable progress is made towards formalising pro-inclusive growth rule changes e.g. draft policies, legislation or regulations.	A significant pro-inclusive growth rule change has been made and interest in the issue is beginning to grow and strengthen
	Practices	**Negligible presence** of inclusive business models or practices in the market.	There are a **limited number of inclusive business models** in the market but they are not wide spread.	**Several** inclusive business models or practices in the market.	**Significant presence** of inclusive business models or practices in the market.	**Dominant, widely adopted** inclusive business models or practices in the market
	Resource flows	**Negligible or single examples** of investment plans and investments of market actors (government and private).	A **limited number** of investment plans and investments of market actors (government and private) are being made.	**Several** market actors are making moderate to large investments, relative to their size and role in the market and others are planning to invest.	**Many** market actors are making moderate to large investments relative to their size and role in the market, but the investment may not be spread across all sizes/roles of market actors.	**Wide-spread** investment (financial and non-financial markets) by a range of market actors that is significant according to their role in the market.
Semi-explicit	Relationships and connections	Marginalised groups' (customers, suppliers etc) linkages to market actors, always or nearly always short-term (spot market), devoid of trust and on disadvantageous terms. The number, volume and frequency of transactions between market actors including marginalised groups are limited.	A **limited** number of examples of relationships between market actors based on long-standing mutual trust; with terms that generate greater benefits for marginalised groups. The number, volume and frequency of transactions between some market actors, including marginalised groups small.	**Several** examples of relationships between market actors that are long-standing and based on mutual trust with terms that generate greater benefits for marginalised groups, and which combine a range of services. Several number, volume and frequency of transactions between	**Significant presence** of long-standing, trust-based relationships between market actors including marginalised groups with favourable terms for marginalised groups. The number and volume of transactions between a range of market actors, including marginalised	**Dominant, wide-spread practice of** long-term relationships, built on trust and loyalty between market actors, including marginalised groups (customers, suppliers etc). Marginalised groups are nearly always consulted and involved in policy changes.

		Marginalised groups never or rarely participate in policy change processes. May never be informed or informed after changes are made.	Limited information provided to marginalised groups on policy changes or consultation in policy processes.	market actors including marginalised groups are limited. Some marginalised groups (customers, suppliers etc) are informed of policy changes and/or limited consultation with marginalised groups during policy processes.	groups, are many and frequent. Government officials and market actors use a variety of mechanisms to involve marginalised market actor groups in policy change processes.	
	Power dynamics	All or nearly all marginalised groups lack organisation and participate in markets (as workers, consumers, producers, business owners) on terms that do not or only in limited ways benefit them. All or nearly all marginalised groups are unable to negotiate terms of transactions or select favourable transaction parties. Very few market players have the freedom to choose between different types of products, qualities, prices There are no constraints on the powerful from exploiting their position.	Few poor and marginalised groups can negotiate their participation in markets (as workers, consumers, producers, business owners) in ways that they realise equitable benefits. A few market players have the freedom to choose between different types of products, qualities, prices There are limited constraints on the powerful from exploiting their position.	Some poor and marginalised groups can negotiate their participation in markets (as workers, consumers, producers, business owners) in ways that they realise equitable benefits. Some market players have the freedom to choose between different types of products, qualities, prices There are some constraints on the powerful from exploiting their position.	Many poor and marginalised groups can negotiate their participation in markets (as workers, consumers, producers, business owners) in ways that they realise equitable benefits. Many market players have the freedom to choose between different types of products, qualities, prices. There are several effective constraints on the powerful from exploiting their position.	**Dominant, wide-spread** evidence of a more equitable power relationships between different market actors and based on terms beneficial for marginalised groups (as workers, consumers, producers, business owners). Constraints to limit the powerful from exploiting their position are effective and trusted by a range of market actors. Most individuals and businesses have knowledge of the market rules and norms to help them make informed decisions as workers, consumers and business owners. Widespread examples of win-win relationships

						despite differences in power.
Transformational – implicit	Mental models	Desired norms are accepted by only a **small minority** in society and exert **no pressure** on market players.		Desired norms are **widely accepted** but **contested** and **exert some pressure** on market players.		Desired norms are almost **universally accepted,** and most market players are forced to respond to them.

Table 2: Rubric: understanding changes in market constraints

	1)Beginning	2)	3)Strengthening	4)	5)Significant
Constraint	**Negligible change** in the targeted constraint		**Significant change** in the targeted constraint		**Dominant, wide change** in the targeted constraint

Table 3: Rubric: understanding outcomes for marginalised groups

	1)Beginning	2)	3)Strengthening	4)	5)Significant
Outcomes for marginalised groups	**None or very few** marginalised groups are positively benefiting from the market system.	A **limited number** of marginalised groups, relative to the context, are positively benefiting from the market system. The depth of benefits, and their longevity, are minimal and make limited difference to poor people's well-being.	**Several** marginalised groups are positively benefiting from the market system. Several groups experience an increasing depth of continued benefits which are making some difference to poor people's well-being.	**Significant numbers** relative to the target population are positively benefiting from the market system. Significant numbers are experiencing a moderate depth of continued benefits which are making a notable difference to poor people's well- being.	**Large numbers,** relative to the targeted system, of poor and marginalised individuals **positively benefiting** from system changes The type, depth and continuation of the **benefits makes a material difference** to poor people's well-being.

2 Background

Section 2.1 briefly describes the pico solar sector, prior to Élan's intervention in the market. This includes the overall policy environment, key business actors present and relationships with customers, together with constraints and the size of opportunities identified. Little information is available on the improved cookstove sector.

Section 2.2 describes Élan's renewable energy strategy over both phases, illustrating changes in its theory of change and intervention focus.

2.1 Élan's analysis of the sector, constraints, and opportunities

In 2014, Élan studied the pico-solar and ICS sectors. Over 2014 and 2016 Élan also completed a business case for micro-hydro and market analysis of private mini-grids[4], but neither of these proceeded to interventions. The reasons for this are not clear, although some interviewees noted related political economy risks in these sectors and the programme's and FCDO's risk appetite.

Further exploration of the pico solar and ICS sectors was undertaken in 2015. Élan identified numerous constraints in these sectors, with the most significant being:

- Competition from cheap products.
- Consumers' low awareness.
- Consumers lack financial capacity.
- All supply chain actors lacked financing.
- The political and economic environment was unsupportive to businesses.
- There were administrative and tax complexities.
- Poor infrastructure and transport costs[5].

2.1.1 Government's renewable energy policy

Prior to Élan's start up, the government had announced one major, positive energy market policy change. In May 2013, the Minister of Energy presented a bill to remove the monopoly held by the national electricity company, SNEL, and liberalise DRC's electricity sector.[6] Relevant legislation was enacted in 2014, which mandated the establishment of: a) ANSER, a new rural energy service provider; and the b) Electricity Regulatory Authority (ARE).

Pico solar are imported and subject to high taxes, equating to 44% at the national level with additional taxes being applied by provincial governments. At the national level they include: 5% for customs fees; VAT 16%; and additional taxes and fees that are calculated based on the bill of costs but were estimated to be 18% on average so that

[4] ASI (2016). Market analysis: privately run mini-grids. March 2016.
[5] 80% of interviewees in Enea's study cited poor infrastructure as a major constraint while 50% noted high transport costs.
[6] This occurred before Élan's work in the sector commenced and therefore is not attributable to Élan.

the total taxation was 44% of the cost insurance freight or CIF cost of products.[7] ICS are manufactured locally and not subject to the same level of taxation.

2.1.2 Status of pico solar and improved cookstoves sectors

In 2015, several businesses were operating in the solar sector, but most were not selling quality verified pico solar products. Businesses included: TOTAL; IDH Energie Solaire; Schneider Electric; Africa Solaire; Ates; Proton; Mwinda Eco Energie; Le Chantier; Setrema; Congo Energy Solaire; Alliance Africaine de Services Electricite; Group Splendeur Energie Solaire; and Sattel International. [8]

Schneider Electric and d.light were the only manufacturers of Lighting Africa quality verified products being sold in DRC. Altech launched in 2013 selling d.light products through schools in Bukavu and then Katanga, Kisangani and other locations in the Kivus. Kit4Africa was established in 2010.

Most of the businesses[9] were:

- Small and still young, with the exceptions of Total and Proton.
- Most were selling products that were not quality verified, including selling low quality 'Chinese' lanterns that were mostly sold by petty traders.
- Most businesses had a local, rather than national presence, using local networks only. Businesses tended to expand their product range rather than to new locations.
- Businesses did not market products and relied on classic distribution and door-to-door sales approaches.
- Businesses did not provide warranties or other benefits to attract customers.

Low priced, low quality "Chinese" products were much more readily available than quality verified pico solar products. It is estimated that of the 500,000 off-grid solar products, including lanterns, sold in 2015, between 72 – 87% were not quality verified products.[10]

Distributors and retailers of "Chinese" products had:

- More developed distribution and marketing strategies that were more effective at 'catching the eye of the poor'[11].
- Greater coverage across the DRC, though were in still concentrated in the east of DRC without a presence in all parts of the country.[12]

[7] PIA (2019).
[8] These were businesses Enea Consulting (2016) interviewed in 2015.
[9] Élan programme documents; Enea Consulting (2016); DSU key informant interviews.
[10] Quality is verified according to industry standards. Élan used the Lighting Global standards for pico solar and solar home systems as its quality benchmark. In 2020, the International Electrotechnical Commission (IEC) published quality standards for pico-products and SHS kits up to 350 Wp. Lighting Global amended its verification process to the IEC standards. The GOGLA sales data of quality verified products is not available before 2016 since there were insufficient sales to maintain confidentiality. In 2016, the volume of sales was 73,983.
[11] DSU key informant interview
[12] DSU key informant interviews.

Banks did not provide loans to businesses or poor consumers. There were no innovative consumer financing offers from distribution companies other than offering credit of several months and collecting it manually.

Stock outages were common, impacted by terms of payment between suppliers and importers. Businesses were required to pay 50% at the time of the order and the remainder prior to shipping. These payment terms, together with the inability to secure working capital loans from local banks, hampered the supply of products as it takes up to six months for products to arrive in the DRC once an order is made.

The off-grid solar market showed significant growth potential (for both quality and cheap solar products). Opportunities in the off-grid sector included[13]:

- The ability to be profitable, with those already in the sector securing good profits. Distributors made margins of between 37% - 57% and retailers between 18% - 45%.
- Kongo-Central, North-Kivu, South-Kivu and the Lubumbashi region had the greatest potential due to population density and sunlight hours.

These challenges resulted in higher prices for consumers, who were most likely to choose products based on price.[14] Affordability of poor consumers was a recognised constraint. In Kinshasa, it was concluded that consumers were able and willing to pay $30 for a product.[15]

Little information is available on the status of the improved cookstove market prior to Élan's intervention. Élan estimated that its size in 2015, based on sales, was less than 10,000 units but there was a potential market up 500,000 to 1 million ICS. Élan decided not to develop interventions in the Kivus initially because of the prevalence of 'free' cookstoves distributed by non-government organisations.[16]

2.2 Élan's renewable energy strategy

Élan 1.0 did not prepare a strategy paper until 2016/17. It had four systems change objectives:

- *MSC 7.1: SMEs produce or import highly efficient energy technologies*
- *MSC 7.2: SMEs implement innovative communication, marketing and distribution models to reach BoP households.*
- *MSC 7.3: Banks provide SMEs and consumers with adequate financial products.*
- *MSC 7.4: SMEs advocate for more favourable tax regime.*

Élan did not seek to changes related to the following constraints: competition from cheap products; the overall political and economic environment that was unsupportive to businesses; or poor infrastructure and transport costs. Élan has only more recently

[13] Enea Consulting (2016)
[14] For instance, prices for DRC consumers were twice that for Rwandan consumers. Matadi, the chief seaport of the DRC and capital of the Kongo Central province, was a bottleneck for distribution, with 15-20-day delays and high informal taxes.
[15] Enea Consulting (2016)
[16] Élan programme documents

identified that lack of standards as a constraint and an underlying cause to competition from cheap products. This may have increased as a concern for businesses as the sector has developed further.

2.2.1 Élan 1.0 theory of change

Élan 1.0's TOC diagram is in Annex 6. A brief description is outlined here, and assumptions listed in Section 3.2 and an assessment about the extent they held true.

The overarching objective for the PSD programme, under which Élan sat, was increased incomes for the poor. Savings generated by poor consumers using quality renewable energy products contributed to this objective, and in turn consumers were expected to use their increased disposable income on income generating activities. [17]

If Élan's market system changes were achieved these would result in:

- increased supply of quality products to address the lack of access to energy for the millions without access to electricity.
- increased consumer awareness and therefore demand for quality products by 'bottom of the pyramid households'.
- increased supply of financial products and services to consumers and businesses, that would enable businesses to purchase more inventory and consumers to buy more products.
- reduced taxes which would result in a more favourable business environment and lower prices for consumers.

Additional household benefits identified included children doing homework in evenings; and access to radio as an path for education and public awareness campaigns.

Élan 1.0 interventions

In 2015, Élan piloted a few partnerships to test business' capacity to adopt new distribution models and marketing practices (MSCs 7.1 and 7.2). The following year was seen as the foundation phase building the basis for scale via advanced pilots, a challenge fund and scoping of solar pay as you go (PayGo) operators. To achieve these market system changes, Élan had to address several underlying constraints through its interventions including payment terms offered to importers; the affordability of quality products to target group; poor access of target group to retailers selling quality products; and reliance of DRC on imported renewable energy products.

Élan's initial interventions focused on pico solar, which were seen as a credible and cost-effective avenue to improve urban households' access to basic energy services since it would take 10-15 years to develop larger off-grid or on-grid solutions in an unfavourable

[17] Élan's earliest market analysis focused on micro-enterprises and households cited global research: 1) The Philippines – increased electrification was estimated to be worth $24 and $36 per month to households and micro-enterprises respectfully; 2) Ghana – electrification increased micro-enterprises incomes. In Ghana, incomes increased by 8% as it led to an increase in equipment purchases and hours worked; and 3) The Philippines and Lao – increased micro-enterprise earnings were realised through opening longer hours and savings in other energy sources such as diesel and kerosene.

business environment. Pico solar is a 'first step'[18] on the energy ladder. Interventions, however, gradually also incorporated or solely focused larger and more expensive solar home systems that were sold on credit, with the intention that this addressed affordability constraints.

Table 1 summarises Élan's intervention according to MSC and constraint while a detailed list is in Annex 7. Most of Élan 1.0's efforts were directed towards the manufacture, importation and distribution of solar pico products and improved cook stoves.

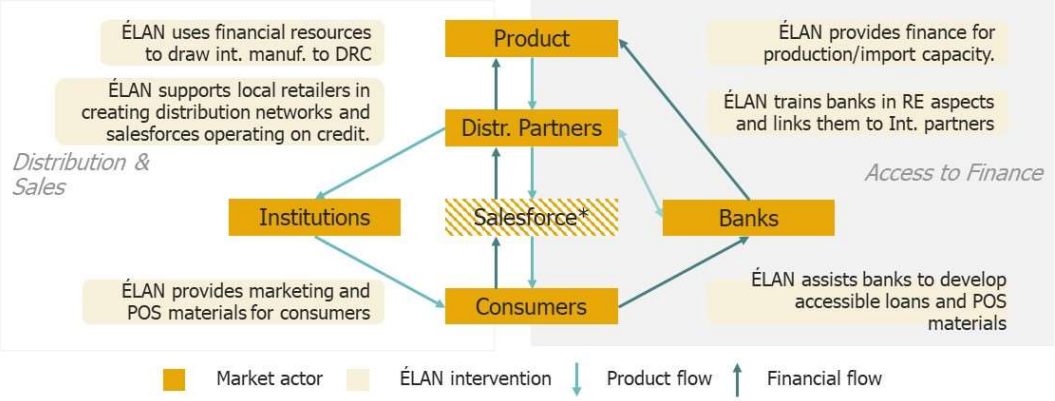
Table 4: Élan 1.0 interventions to address constraints

Constraint	System change	Interventions
Lack of access to affordable energy	1.SMEs produce or import highly efficient energy technologies	Provide guarantees to manufacturers of solar pico products for sales to DRC importers. Co-fund expansion of distribution to new locations. Co-fund market studies for international renewable energy businesses (manufacturers and PayGo operators) to encourage their entry into DRC. Co-fund the purchase of manufacturing equipment for improved cookstoves and training to improve product quality
Low consumer awareness	2.SMEs implement innovative communication, marketing and distribution models to reach BoP households	Co-fund new distribution model pilots by local businesses already selling renewable energy products or fast-moving consumer goods. Co-fund the design and implementation of national marketing campaigns. Provide business training to DRC businesses.
Businesses and consumers lack access to finance	3.Financial institutions and actors along the RE supply chain provide SMEs and consumers with adequate financial products[19]	Co-fund partnerships between solar distributors and ICS manufacturers, banks and telecommunication companies to design and sell renewable energy credit products to consumers. Co-fund the adoption of pay as you go business models by businesses selling solar pico and ICS. Provide funding to BDS for loan to local renewable energy business to support their growth.
High taxes	4. SMEs advocate for more favourable tax regime	Facilitate the establishment of renewable energy industry association

Élan sought to address issues of supply and demand, as highlighted in Figure 1.

[18] Élan programme documents; Grimm, M., et al (2016).
[19] Previously 7.3: Banks provide SMEs and consumers with adequate financial products

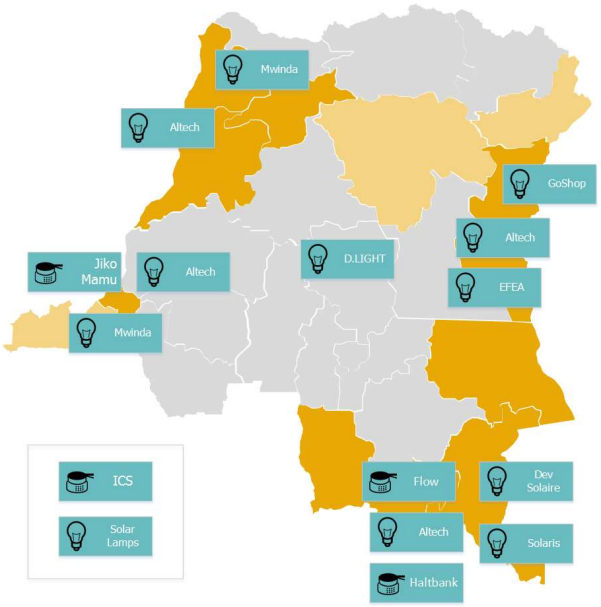
Figure 1: Élan 1.0 renewable energy interventions



Élan 1.0 interventions were implemented in North and South Kivu, Katanga, Kinshasa, Equateur, and Kasai. The Kivus, Katanga and Kinshasa were densely populated rich zones, while Equateur and Kasai were considered densely populated poor zones.

Élan[20] initially pursued ICS interventions in Kinshasa and Katanga, two relatively affluent areas of the country. Élan started an ICS intervention in Goma once a key programme subsidising ICS finished.[21]

Figure 2: Élan 1.0 geographic focus (2015/16)



2.2.2 Élan 1.2 theory of change

Élan updated its ToC for the implementation of Élan 1.2 (2019-2021) in response to Élan 1.0 successes or otherwise e.g. where the programme's assumptions did not hold true (see Annex 6 for the TOC diagram and Section 3.2 for the assumptions underpinning

[20] ÉLAN (2018). Project Completion Report
[21] ÉLAN (2016). Annual Report.

the TOC and the extent to which they held true). Élan also revised its MSC objectives twice with the final MSCs being:

- *MSC RE1 – RE companies can serve lower income customers and new Élan areas.*
- *MSC 2: RE companies secure favourable policies and terms with public authorities.*
- *MSC 3: Investors and financial institutions invest in Congolese RE sector.*

Adjustments made during Élan 1.2 included:

1. The impact level logic was adjusted to capture environmental benefits in addition to economic benefits for lower income consumers, whereas the earlier ToC referred to cost savings (i.e. net additional income) for poor consumers. This also reflects FCDO's increasing emphasis on climate change and green growth.
2. Élan 1.2 changed the actor that was expected to provide finance to businesses, broadening the focus from local banks to financial institutions (of which local banks are one) and other supply chain actors, then later to also include impact investors. Rather than banks, suppliers and distributors were expected to provide consumer credit.
3. Under Élan 1.0, businesses were expected to advocate the government for a more favourable business environment. Under Élan 1.2, this was changed to businesses securing favourable policies and terms with public authorities.

Section 4.1.1 and 4.1.3 provides more detail on these developments.

Élan 1.2 interventions

Élan 1.2's interventions built on the first phase but undertook fewer activities than planned due to the onset of the coronavirus pandemic in early 2020. Some planned interventions did not proceed while Covid-19 specific interventions were implemented. These did not contribute to Élan's market systems change objectives and are not covered by this study.[22]

Table 5: Élan 1.2 interventions

Constraint	System change	Interventions
Lack of access to affordable energy	1.RE companies can serve lower income customers and new Élan areas	Co-fund local solar importers to expand to new locations, including refugee camps.
High taxes	2: RE companies secure favourable policies and terms with public authorities	Provide funding and technical assistance to renewable energy association to strengthen its capacity

[22] Élan funded the installation of solar panels on five health centres and subsidised the $48 of the total $120 price of 1,938 solar home systems for consumers in Kinshasa. These changes reduced Élan's resources to increase the sustainability of market systems changes, which was the purpose of the extension.

Business and consumers lack access to finance	3: Investors and financial institutions invest in Congolese RE sector	Co-fund the design and development of pay as you go software and hardware for improved cookstoves. Organised and funded renewable energy investment forum

For Élan 1.2, Élan reduced its geographical focus to North Kivu, South Kivu and Kasai Central, in response to changes in FCDO's own geographic focus.

3 Relevance

3.1 A2: To what extent was Élan and the interventions it supported appropriately designed to meet the needs of stakeholders and target beneficiaries?

Sub-questions

- How important (market actors including target beneficiary) were the MSCs that Élan chose to address to stakeholders?
- How appropriate were the interventions to target the constraints?

This section first section describes Élan's target beneficiaries who are poor consumers and also the businesses that could potentially serve poor consumers' needs.

3.1.1 Needs of target beneficiaries

Élan's analysis of the pico solar market identified market opportunities in urban centres and densely populated zones (Table 6), with a total market size of 6.3m people.[23]

Table 6: Potential customer segments for solar consumers

Segments		Current	Locations	Size of market	Value of market
Urban centres	Back-up	On-grid Solar	Kinshasa Lubumbashi	1.5 m	$17.6 m
	Switch	Kerosene	Kisangani Mbandaka	0.8 m	$9.7 m
Densely populated poor zones		Torch	Bandundu Kasai Oriental Kasai Central	2.7 m	$16 m
Densely populated rich zones		Kerosene Torch	Bas-Congo North Kivu South Kivu	1.3 m	$8.2 m

Only 19% of people living in urban areas have access to electricity, and while the tariff is low supply is often irregular. Fifty-seven percent of the urban population is poor, living below the $1.90 per person per day poverty line. This equates to around 20.1m people across the country.

It is not clear what proportion of the 6.3m people identified in Élan's analysis were expected to be poor. However, at least a proportion of consumers were expected to already have access to affordable energy through access to the grid, even if this was unreliable access.

DRCs population is made up of 77% poor, 14% below $3.20 PPP per person per day and 7% more than $3.20 PPP pppd. **Two percent of the population is rich.** Élan 1.0 did not use a specified poverty line to describe its target beneficiaries, although its

[23] Enea Consulting (2016)

poverty profiling study in 2018 analysed customers according to $1.90 and $3.20 per person per day. Élan 1.2 used $3.20 as the point of reference for its target beneficiaries..

Table 7: Poverty Lines (2012)[24]

Poverty Line	Criteria	No. of Poor	% of population
DRC National poverty line		44.1m	63.9%
International poverty line	1,112.8 in Congo franc (2012) or US$1.90 (2011 PPP) per person per day	52.8m	76.6%
Lower Middle Income Country poverty line	1,874.2 in Congo franc (2012) or US$3.20 (2011 PPP) per person per day	62.8m	91%
Upper Middle Income Country poverty line	3,221.2 in Congo franc (2012) or US$5.50 (2011 PPP) per person per day	67.4m	97.7%

Annex 10 provides additional information on poverty levels in the DRC.

Élan's studies found **poor consumers willing and able to pay $20 - $30 for a lantern and $20 for an ICS[25].** If paying cash, they could afford a lantern. Households, generally, wanted energy systems that offered more services than a lantern or charger, e.g. higher capacity solar home systems, even if they could not afford them.

Consumers did not have access to credit, to help them buy and pay for products in regular instalments.

3.1.2 Needs of businesses

Élan needed to incentivise local and international businesses to increase their distribution channels and product ranges to serve poor consumers in ways that were still profitable while working in a challenging environment.

The business environment in DRC is poor, and scores poorly across global business environment indices (See Box 2). Local and international businesses had different needs. Local businesses have indepth knowledge of the local context and relationships but were smaller, less experienced and required higher levels of technical assistance. International businesses were larger, but more risk adverse about operating in DRC and demanded more risk-mitigation interventions than local businesses.

Box 2: DRC's performance in key global business environment indices

According to the World Bank Doing Business survey (2014 – 2020), the business environment made incremental improvements between 2014 and 2020 but remains challenging. DRC scored 33.8 out of 100 in 2014 and 36.2 in 2020. There had been a slightly faster change of improvement between 2010 and 2014. In 2020, DRC ranked 183 out of 190 countries illustrating how difficult it is to do business in DRC By comparison, Kenya has moved from 53.9 to 73.2 (ranked 56 in 2020) and Nigeria from 47 to 56.9 (ranked 130 in 2020) over the same period.[26]

[24] World Bank (2019a).
[25] Enea Consulting (2016); Élan (2017). Customers based in Kinshasa were willing to pay $30.
[26] World Bank (2021). Data from doingbusiness.org website

The time and cost for importing goods in 2020 is much higher than the Sub-Saharan Africa average: In DRC the cost of border compliance is over $3,000 compared to SSA average of less than $700 and time required for border compliance is nearly three times as much. Compliance with import documentation is better but still worse than the SSA average: $765 versus $287 and 174 hours versus 96 hours.

In the Logistics Performance Index, DRC scored 1.88 in 2014 and 2.43 in 2018, so that by 2018 DRC reached Kenya and Nigeria's 2014 score of 2.43 and 2.40 respectively. By 2018, Kenya and Nigeria both scored 2.81.

DRC scored 18 out of 100 on Transparency International's Corruption Perception Index in 2020, slightly worse than the score of 22 in 2014. According to the 2019 Global Corruption Barometer Africa, 85% of citizens interviewed perceived that corruption had increased in the previous 12 months, representing the highest percentage in sub-Saharan Africa. [27]

3.1.3 Appropriateness of interventions to meet needs

Élan's interventions aimed to address specific factors that hampered the needs of poor consumers and businesses serving poor consumers. In several cases there is limited information available on the design of interventions and the assessment of the appropriateness of design is based on limited information provided by interviewees.

Assessing the appropriateness of Élan's interventions is informed by the effectiveness of interventions (see Section 4) and the extent to which assumptions underpinning the TOC and interventions held true (Section 3.2). Élan built its knowledge of the sector and pathways to change by working in the sector. As such it is reasonable that not all assumptions have held true and that some interventions were not successful. However, as we conclude in Section 4, some of Élan's assumptions seem implausible and this affected intervention designs, and therefore how quickly Élan learned and adapted is important.

Access to products

Business development services were appropriately designed to meet some needs of businesses, but not all. To improve distribution networks by local businesses, early interventions focused on developing management capacities and introducing new distribution models. Enhancing the management capacity of local businesses was highly valued by businesses and positively impacted their growth. However, Élan underestimated the capacity needs of local businesses and with the objective of achieving targeted results within the implementation period, it broadened its focus to international businesses. After initial training for local businesses, Élan did not continue with more intensive or targeted efforts to develop capabilities. It is expected, although evidence is weak, that Élan continued to provide capacity support to other businesses in an ad-hoc way through other interventions. An exception was Altech, that was supported through ongoing business development service support, including a loan. This support likely also helped Altech access other finance.

In the ICS sector, Élan supported technical training and the purchase of manufacturing equipment to improve product quality.

[27] CMI (2020).

Interventions to expand distribution models and networks are partially designed appropriately to meet needs of consumers and businesses, although key issues remain: the affordability of products imported and distributed, and the cost of reaching poor consumers.

Élan 1.0's early interventions included the importation and distribution of pico solar products within the price bracket of $20-30 to new urban and densely populated regions of DRC. Élan also tried to convince local businesses to import ICS prior to their partnership with Burn Manufacturing. Latter interventions included the importation and distribution of solar home systems, with some partners only selling higher priced items on the assumption that increasing access to credit would make them affordable to lower middle-income consumers. However, SHS are not affordable to most of the target group, not only due to the price but because they also will not meet credit criteria.

New distribution models have reached more very poor, poor and non-poor consumers. However, the cost of some distribution models, e,g, high cost of direct sales approaches, contracting sales agents as employees rather than paying on commission; and sales agents handling of credit. They did not continue much beyond pilots. That said, a few businesses have continued with sales agents and ambassadors.

The lower profit margins on pico solar compared to solar home systems has seen some businesses stop selling pico solar. For some businesses, it appears they have not been able to reach sufficient volume of sales to make targeting this end of the market attractive.

Marketing related interventions were mostly not appropriate: Marketing campaigns did not always result in increased sales for businesses and several businesses were not satisfied with the outcome. Campaigns were designed and delivered as national campaigns to increase awareness of pico solar in general and not any specific brand, distributor or retailer. They also did not focus on specific regions relevant to partners' distribution networks. The budget was also small for the scope of the campaign.

Élan's support to marketing also aimed to influence businesses' views on the value of marketing. It partially did this, but the national campaign approach likely dampened its influence on businesses.

Access to finance for business

Access to finance for business interventions have had limited success, but there is limited information on why and if this relates to the appropriateness of the design.

Guarantees provided by Élan and involving banks and importers were considered too complicated for banks. Élan provided guarantees to manufacturers, but manufacturers do not seem to have improved payment terms for importers after Élan's guarantee.

Élan designed an investment conference but there is insufficient information is activities following the conference.

Access to finance for consumers

Interventions concerning access to finance for consumers and involving banks and financial institutions appear to not have been designed appropriately to meet the needs of banks. These were not successful, and there is limited information on the activities that were implemented or factors affecting success. Based on interviews it

appears intervention designs did not sufficiently address underlying formal and informal norms of financial institutions, even though Élan was trying to change these. Additionally, it could demonstrate that there was not a sufficiently strong business case regarding selling pico solar to poor consumers.

Interventions supporting consumers to access credit for pico solar meets the needs of poor consumers more so than those that concern access to credit for SHS. Élan has been more successful in increasing access to consumer finance via manufacturers and distributors, of which only one offers credit for lanterns. ICS manufacturers may also provide consumer credit and Altech has piloted a PayGo model for ICS.

Élan worked with several businesses to try and get them to adopt and pilot the PayGo model that would provide credit to consumers. Given this model requires high amounts of working capital, it is only feasible for businesses that have sufficient internal funds or can access international finance. Several businesses did not see it as viable for them.

Reducing taxes on pico solar products

Élan's support to set up and support ACERD was appropriately designed, although whether this was the quickest way to achieve reduce taxes for the sector is debatable. Working with government to achieve change is typically also slow. Élan's support to businesses to secure individual tax exemptions has not met the needs of the sector, but rather contributed to inequalities.

Élan established an industry association of renewable energy businesses, which was then expected to lobby the government. This indirect approach took time, so that by the end of Élan 1.2, sector-wide tax exemptions have not been secured. Élan proposed that the delay in addressing the constraint was because the sector had to grow more so there were enough businesses interested in an association before it could be established. This may be true in terms of supporting the association. Alternative approaches would have included working directly with the government, which Élan says would have undermined its ability to build trust with businesses and because its sister programme, Essor, was mandated to work with government on business environment issues.

While Élan has taken its indirect approach, a small number of businesses have secured individual exemptions that has created an uneven playing field. Élan supported these businesses to develop justifications for the exemptions.[28]

Targeting poor female consumers

ICS interventions designed to specifically benefit poor female consumers have not been successful, with affordability and quality remaining concerns. Élan did not support these interventions in its second phase. Challenges such as businesses' low management capacity and an inability to reach large numbers of beneficiaries meant Élan moved away from supporting sectors where there were larger proportions of female beneficiaries. Overall, women made up nearly 45% of pico solar and ICS customers.

[28] DSU key informant interviews

3.2 A3: To what extent did the intervention logic and assumptions of the Élan project (and its interventions) hold during implementation?

To answer the evaluation question, we have drawn on findings in Section 4. In Annex

Table 8: Assumptions underpinning Élan's theories of change

	Assumption	
1.0	Supporting local solar and ICS companies would be sufficient to reach scale.[29]	This did not hold true.
1.0	Poor consumers would switch to lighting products, replacing kerosene and battery torches and lights with solar, and traditional cook stoves with ICS.	This only partially held true.
1.0	New distribution models would be adopted by local businesses	This has partially held true.
1.0	Banks would be willing to develop relevant products and provide credit once they understood the financial aspects of renewable energy technologies.	This has not held true.
1.0	Local companies would be willing to use their own capital to support sales on credit.	This has only partially held true.
1.0	Manufacturers are willing to allow distributors to buy on credit, which in turn would enable distributors to pass on credit to final consumers.	This has mostly not held true.
1.0	Distributors collect customer information, use monitoring tools to facilitate payment terms and instil confidence in providing credit.	This has mostly held true
1.0	Customers would repay credit.	This is partially true but not yet fully tested.
1.0	Renewable energy companies expand from key to other regions in DRC; and expand their product offering.	This has mostly held true
1.0	After international manufacturers of solar lights and ICS had been attracted to the DRC, they would attract sufficient investment for production to occur in DRC.	This has not held true.
1.2	Sufficient renewable energy companies would be willing to join an industry association.	This has held true but sustainability needs to be tested
1.2	Élan can incentivise renewable energy businesses to serve lower income consumers within its lifetime.	This has partially held true, and sustainability needs to be tested
1.2	Renewable energy companies remain interested in working with Élan, including moving to new locations, and implement all contractually agreed activities.	This has held true.
1.2	Élan's activities contribute to concrete improvements in the business environment.	This has not held true.

[29] Élan (2016). Annual Report.

1.2	The affordability of renewable energy and clean energy products is the main standard for a profitable and sustainable sector in DRC.	This has held true and is still being tested.
1.2	Increasing the affordability and accessibility of renewable energy products in North and South Kivu, Kasai Central will increase the net income of vulnerable groups and poor men and women.	This has held true for a few, but the increase in income is limited.
1.2	Élan partners' sell products that are affordable to lower income people.	This has partially held true.
1.2	Low-income consumers will buy RE products from Élan partners, they will use them appropriately and benefit economically and financially from this use.	This has partially held true.
1.2	There is sufficient consumer demand for Élan supported innovations including a national platform and the expansion of distribution networks.	This is yet to be fully tested.
1.2	Partnering with Élan reduces the risk related to entering new remote markets to serve low-income customers that they would not have otherwise served.	This has held true in most circumstances.

4 Effectiveness

4.1 B2: To what extent has Élan led to improvements in market systems?

Sub-questions:

- How, and how much, have targeted constraints and MSCs changed during the period of Élan's support?
- How, and how much, have Élan's interventions changed: policies, practices, resource flows, relationships and connections, power dynamics and mental models); and benefits for market actors including poor and marginalised target groups?
- To what extent have the key growth drivers and potential impact indicators identified in Élan's Project Completion Report materialised over time?

This section presents findings according to six, interrelated, types of changes (policy, practices, resource flows, relationships and connections, power dynamics and mental models). Each has its own sub-section.

The tables below illustrate the market systems change. ■ indicates where the system was in 2015 when Élan commenced its work in the sector and ● where the market is now in 2021. Descriptions for the performance levels, beginning through to significant, are outlined in Annex 4.

Table 10 illustrates changes in each of the constraints to inclusive market development that Élan identified in 2015. Each key constraint has been linked to a particular type of change.

Table 9: Assessment of changes in constraints

	Contraint	1)Beginning	2)	3)Strengthening	4)	5)Significant
1	Political and economic environment (policy)	■●				
2	High taxes (policy)	■●				
3	Competition from cheap products (policy / practice)	■●				
4	Businesses access to finance (resource flow)	■➔	●			
5	Poor consumers access to finance (resource flow)	■➔	●			
6	Consumer affordability (power dynamics)	■●				
7	Consumer awareness (mental model)	■➔	●			

We see some small changes across each type of changes in our conceptual framework, which is based on a belief that changes to mental models and power dynamics will lead to more fundamental and sustainable improvements than if changes only happen at the policy and practices level. However, it is also harder to achieve change at this level.

Table 10: Assessment of market system changes

Market system change	1)Beginning	2)	3)Strengthening	4)	5)Significant
Policy		■➔	●		
Practices	■➔	●			
Resource flows		■➔	●		
Relationships and connections	■➔	●			
Power dynamics	■➔	●			
Mental models	■➔	●			

Annex 8 contains a summary of progress against the key drivers Élan identified in its initial Project Completion Report (written in December 2018, prior to the contracting of Élan 1.2 in 2019).

Information relating to impact for target beneficiaries is mostly contained in the next section that looks at impact.

4.1.1 Policy

- How, and how much, have targeted constraints and MSCs changed during the period of Élan's support?
- How, and how much, have Élan's interventions changed: policies, practices, resource flows, relationships and connections, power dynamics and mental models); and benefits for market actors including poor and marginalised target groups?
- To what extent have the key growth drivers and potential impact indicators identified in Élan's PCR materialised over time?

In the context of this study, **policy related systems changes relate to the government's renewable energy policies, regulation, and actions to support the sector, and specifically those that relate to the pico solar, SHS and ICS sub-sectors.**

This section first summarises changes in the overall policy environment before focusing on the key policy-related constraint targeted by Élan. The related market system change was:

- *ÉLAN 1.0: MSC 7.4: SMEs advocate for more favourable tax regime.*
- *Élan 1.2: MSC RE3: RE companies advocate for a more favourable business environment. /*

This section also highlights two issues not targeted by Élan but raised by interviewees. These are the competition from low-quality and low-price products; and high collateral requirements for businesses seeking finance from local banks. It is possible that Élan did not address these critical issues because of it was focused on working with the private sector and did not see pathways to resolve these issues without working with government.

Overall renewable energy policy environment

DRC Government policy rhetoric broadly supports the development of the country's renewable energy market, with one major policy pronouncement in recent years. The challenge is that the rhetoric is not yet backed-up with much action. In 2020, President Tsheskedi announced a plan to double energy access by 2023 and advocated for off-grid solar solutions. In 2021 he committed $5m to the renewable energy Mwindi Fund, an initiative that is aiming to raise $500m by 2024 for rural energy access[30]. The creation of this fund was the subject of lobbying by Association Congolaise pour les Énergies Renouvelables et Décentralisées (ACERD), with Élan's and other donors' support.[31]

[30] Élan website. News agencies reported that the World Bank was contemplating investing $100m in the Fund, but the status of this at the time this study was conducted was not clear.
[31] Little evidence was collected to support Élan's claim of its contribution to the establishment Mwinda Fund via ACERD, or the extent to which ACERD was a driving force. See Section 4.1.4 for further information on ACERD's effectiveness. An interview was requested of ACERD, but they did not confirm. Other organisations, such as the Tony Blair Institute also claim to have influenced the establishment of the Mwinda Fund.

The government has not followed through with strong actions and interviewees were still waiting to see the government's commitment to support renewable energy:

- *Electricity market liberalisation*. While welcoming the creation of ANSER and ARE six years earlier, at the time interviews were conducted for this study, the appointed Head of the organisations had only recently been appointed, of which one was still living in the US with no clear plans for when they would take up their role. The establishment of ANSER would also likely mean changes for UCM and their current central coordination role.[32]
- *Increasing access to energy*. Several interviewees recognised the potential of the Government's Mwinda Fund but were critical that there were not yet obvious measures to implement it, and there had been no significant shifts in policy for the renewable energy sector and its contribution to inclusive growth.

Interviewees also cited lack of progress in other commitments made by the Government to improve access to energy, namely a third dam, Inga 3, on the Congo River that has yet to materialise despite commitments made over the last two decades.

High taxes on renewable energy products

Taxes on renewable energy products remain high, unclear and inconsistent, creating business uncertainty as well as high prices for consumers. In 2019, taxes were 44% at national level with additional taxes applied by provincial governments at the start of Élan[33]). Tax requirements and rates are also not harmonised across provinces and provinces regularly increase rates. Many businesses do not understand the array of taxes they are required to pay.[34] USAID estimated taxes represented 35% of the final price for consumers affecting affordability as well as the ability to raise finance.[35] A 100% reduction in customs taxes (5%) and VAT (16%) is expected to increase cumulative demand from poor consumers (earning $50 – 100 per month) by 100%.

Élan wanted businesses to advocate for changes to the tax regime. While not explicit the intention was to precipitate sector-wide change. This has not been achieved. Élan's approach to work via an association that it had to first help establish after the sector reached a certain level of maturity means that it would realistically take longer to achieve its desired outcome. Most interviewees perceived that ACERD had not been effective since a sector wide exemption has not been secured.[36] An Élan staff member was seconded to support ACERD, but has now finished, and while ACERD have recently appointed staff, capacity is constrained.[37]

Élan may have taken other actions alongside setting up ACERD, but these are not documented[38]. One interviewee noted that Élan had tried to talk to the Ministries of

[32] DSU key informant interviews
[33] Based on DSU key informant interviews. Information on the type and level of taxation was not available.
[34] Key informant interviews.
[35] DSU key informant interviews.
[36] See Section 4.1.4 for more discussion.
[37] DSU key informant interviews
[38] Documentation on what Élan did to influence the government, beyond supporting the establishment of the industry association, is not available. Information is also somewhat contradictory since Élan also stated they did not have a mandate to work with the government.

Finance and Energy, but they did not know the outcomes of this effort. Another interviewee commented that Élan had mainly tried to influence government through conducting and disseminating research on the benefits of tax changes and suggested the project could take a more proactive approach to building support for such changes.

In the absence of a sector-wide exemption, individual companies have sought their own exemptions. Interviewees cited three companies that have secured individual exemptions: Altech, BBOXX and Orange Energie. Only Altech sells lanterns. Altech and BBOXX are Élan partners and, according to interviewees, were supported with their applications for exemptions to the National Investment Promotion Agency (ANAPI).[39] It is unclear what the exemptions cover for each business but features mentioned include a temporary decrease on import taxes, but not VAT; for a specified number of years or for single shipments; and exemptions from taxes in specific provinces. [40]

Interviewees expressed mixed views on the ease and transparency of obtaining tax exemptions. While one interviewee noted that ANAPI published information on their website they also emphasised that businesses needed to word their applications carefully to stress that they are providing a service rather than describing their commercial model. In contrast, another interview noted: "*The exemption process is not clear in practice even if it is in theory".* Élan had earlier also identified that local businesses were reluctant to engage with the government, another factor that may affect the current situation.[41]

The exemptions have created an uneven playing field. While there has been an increased number of businesses operating in the DRC, competition is likely still weak and as such there may be insufficient incentives for the companies that have obtained exemptions to pass on full savings to consumers. It appears that since the businesses with exemptions are offering credit, they have used the tax reductions to enable them to lengthen payment terms. This reduces the monthly payments for customers, but likely increases the total price.

Most solar companies believe the market is skewed in favour of large foreign businesses who have obtained government tax exemptions[42] Two of these businesses also hold key roles in ACERD (President and Vice-president) prompting criticism from several interviewees that ACERD seeks government favouritism for preferred companies. Interviewees raised questions about ACERD's capacity and interest in obtaining a sector-wide tax exemption. Two other solar companies interviewed

[39] Based on key informant interviews, programme documents do not include information on this support.
[40] One interviewee noted a reduction from 30% to 5%, another a five-year time frame; and another thought the wavers were for single shipments and applications were needed for each shipment. Additionally, some companies selling large systems also reportedly have exemptions. Requirements to secure exemptions included the number of jobs created for Congolese and reporting requirements were noted to be arduous and exemptions may not be applied if jobs created were less than earlier promised. USAID (2019) noted Altech's exemptions were a 3-year waiver in Kinshasa and 5-year in Haut-Katanga; and BBOXX
[41] Élan (2016). Lessons Learned Report
[42] BBOXX is a UK company, Orange Energie is French and Altech founders are Congolese who were refugees in Tanzania. Altech and BBOXX secured their exemptions with support from Élan (according to interviews). These businesses may have been able to secure an exemption from ANAPI by arguing that they are providing a service rather than an asset: that is, BBOXX offers an asset-service hybrid—appliances, such as lights or TVs, that are paid off in 36 months, but the solar unit itself is on a 10-year lease. Orange Energie also sells solar home systems using a lease or subscription model thereby again providing a service.

added that ANAPI had not responded to their applications for exemptions made several months ago.[43]

Lack of product quality standards and enforcement

The lack of policy and regulations for quality standards are a concern to businesses selling quality verified products, including those that are targeted at lower income consumers as well as products like street lighting. Businesses interviewed see 'Chinese' products as key competition, against whom some say they are struggling to compete for customers.[44] For products targeted at lower income consumers, the unverified products however provide consumers with more choice. Restricting access may be a negative result for poor consumers. Some interviewees were also critical that a sector-wide tax exemption supported by Élan would serve to increase the competition they face from low-quality, Chinese products if standards were not also addressed.[45]

The prevalence of cheap, poor quality solar products in the DRC is partly a product of the absence of industry quality standards. Élan supported the importation of quality verified pico solar and SHS and interviewees reference the internationally recognised industry standard developed by the IFC initiative Lighting Global, who also provides certification services (Verasol). We have accepted that Élan partners import products that are much better quality than the 'Chinese' ones, but do not have information on product quality.[46]

The wide availability of 'Chinese' products is likely to remain, if not grow according to several interviewees[47]. Imports are admitted into the country without needing to meet specific standards. Interviewees noted that 'the market is still overwhelmed by bad quality products',[48] which are readily available in many areas of DRC.[49] This situation also affects other countries in Africa[50] and not only pico solar and SHS but also other products like street lighting.[51] Some interviewees cited examples of counterfeit products and how this hinders their business, including one business that identified counterfeit products when a customer attempted to have a faulty product replaced, while another noted:

> *'Local and artisan producers [of cookstoves] copied our product and went even further to paint their product like ours, selling it at a cheaper price'.*

Early in phase 1, **Élan shifted focus from promoting poor consumers' access to all pico solar products to promoting their access to quality verified solar products.** Initially, Élan was agnostic in its support, on the rationale that the most important issue was increasing poor consumers access to affordable access to lighting. However, Élan moved to focus only on the market for certified by organisations such as Lighting Global

[43] DSU key informant interviews
[44] DSU key informant interviews and Élan programme documents (including interview notes)
[45] DSU key informant interview
[46] Partnership agreements do not specify that products must meet a specific standard.
[47] DSU key informant interviews
[48] https://www.trade.gov/country-commercial-guides/democratic-republic-congo-standards-trade; DSU key informant interviews
[49] DSU key informant interviews
[50] Tetra Tech International Development (2020).
[51] DSU key information interview.

(a World Bank and IFC initiative),[52] because of other benefits, such as durability, to consumers, staff's experience with verified products and the difficulties and risks of engaging with traders who sold low-quality products[53].

Élan's support for quality products has not decreased the supply or demand for low quality, cheaper quality products. Élan did not design interventions to address standards, and it did not expect that its support would have an impact on the supply of low-quality products. Rather over time, it believed demand for quality products would increase as consumers valued quality, durability and warranties. Many poor consumers continue to prefer cheap, solar products over the higher-priced, quality-certified products[54]. One interviewee noted:

> *The availability of lower priced 'Chinese' products means that it is sometimes difficult for consumers to accept the prices for better quality certified products.*[55]

This is discussed further in Section 4.1.6 – Mental Models.

Access to finance for businesses

Access to finance has been a large part of Élan's work and also relevant for the renewable energy sector, as highlighted by the key constraints that the programme identified in 2015. A key policy issue cited by interviewees was the high and strict collateral requirements for businesses. Élan did not seek to address this underlying cause for the lack of access to local finance.

[52] DSU key informant interviews
[53] DSU key informant interviews
[54] DSU key informant interviews
[55] DSU key informant interview

4.1.2 Practices

In the context of this study, **practices relate to the activities of the businesses that Élan partnered with as well as those it did not but sought to influence. Businesses' practices are embedded in their business models, as well as internal management processes, procedures, and behaviours.**

Élan was particularly interested in the adoption of inclusive business models and functions that provide opportunities to the poor (as suppliers, consumers or employees) in commercially viable, scalable ways. Élan sought to encourage local and international businesses to market and sell affordable, quality renewable energy products to DRC's poor consumers.

Élan sought two key practice changes. Under Élan 1.0, these were expressed as:

- *MSC 7.1: SMEs produce or import highly efficient energy technologies (increasing supply of quality products);*
- *MSC 7.2: SMEs implement innovative communication, marketing and distribution models to reach Bottom of Pyramid (BoP) households (increasing BoP households' demand for quality products).*

Élan 1.2 merged these to:

- *MSC RE1 – RE companies can serve lower income customers and new Élan areas.*

This section is structured around key practice changes that Élan sought to stimulate.

New distribution practices

The primary aim of Élan's support for new distribution models was to reach poor consumers. Before Élan, most businesses did not market products and sold to consumers only through shops. Élan promoted the adoption of direct sales distribution models that used sales agents and ambassadors to reach out directly to individuals and households through institutions, such as schools and hospitals. Élan also supported businesses to distribute to new regions including Equateur, Kinshasa and Kasai. Prior to Élan businesses tended to expand to areas closer to the location where they initially started or expand the products they sold rather than to new locations.

New distribution models have been adopted and some businesses are continuing to use them, but with adaptions. However, not all businesses were satisfied with the models that Élan wanted them to adopt. The more actors there are in a distribution chain, the more profit margins must be shared. Businesses have continued to adjust models introduced by Élan to reduce costs, manage challenges, and increase profitability. For instance, two businesses interviewed reported they no longer uses sales agents, of which one business noted the sales agents' compensation structure introduced by Élan did not work. With Élan's support, d.light established operations in DRC but moved from a direct sales model to being a distributor to decrease its costs and no longer operates in the DRC. One interviewee noted that vertically integrated models were most profitable, suggesting this was a lesson for Élan and its support to businesses.[56] In the ICS sector,

[56] DSU key informant interview.

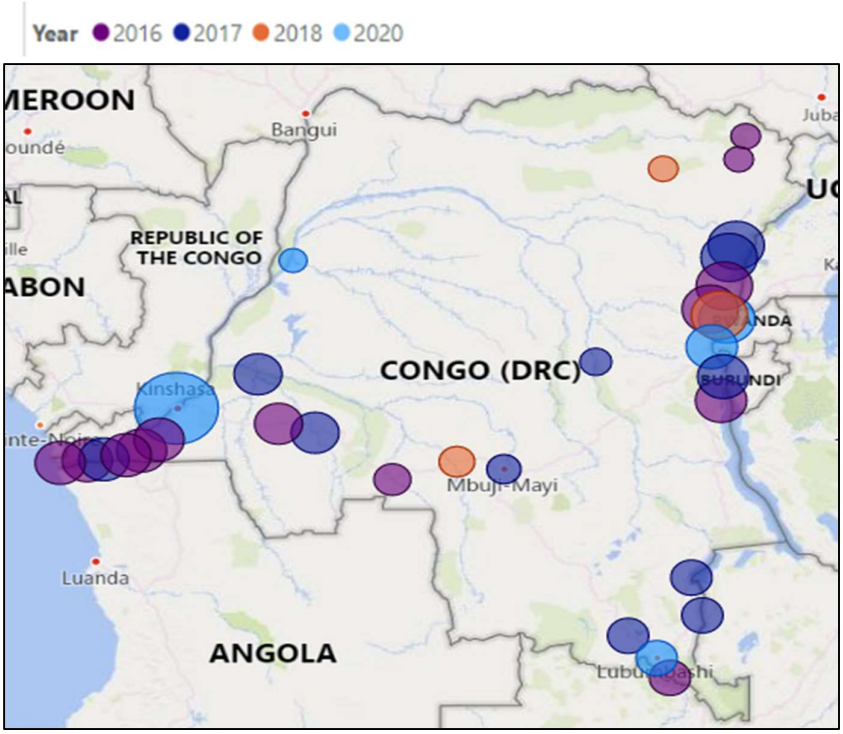
Halt Bank experienced challenges with sales agents handling credit sales and repayments so adjusted to only use distributors.

New distribution models have increased sales. This is discussed further in Section 4.1.4.

Linked to the new distribution models, **Élan support for businesses to extend their reach to new provinces has mostly been successful and most have maintained a presence in the expanded locations.** Even where businesses have not continued distribution to targeted regions, some still believe there are opportunities if some of the challenges can be mitigated. Expansion is challenging due to DRC's large geography, logistics problems and consumers' low purchasing power in some areas.

Altech has had the most impressive expansion of its distribution network. **Diagram 1** illustrates when Altech started distributing in new locations with the greatest expansion occurring over 2016 and 2017 and slowing down in 2018 and 2020 (The size of the bubbles indicates the size of the population in these locations). Altech implemented PayGo from 2017 and it is not known if the slowdown in expansion to new locations is due to the change in business model.

Figure 3: Growth of Altech's distribution network



Mastajabu did not continue with sales in Kananga beyond Élan's support due to the political and security situation and Eco Mwinda stopped selling products in Equateur due to low consumer purchasing power. Dev Solaire also experienced significant challenges in transporting goods to Kasai, which was supported by Élan. While Dev Solaire was eventually able to determine a new logistics route via Angola and had secured sales in Kasai before the product arrived, the experience proved significantly more expensive and riskier than they envisaged.

It is not clear whether the changed practices of Élan's partners – those which have been sustained by the partners themselves – have influenced other businesses. There are anecdotal stories of some new businesses selling pico solar products, including 'following' Élan's partners to new locations, but these seem to be via traditional distribution models such as shops rather than copying direct sales models.[57] There are also anecdotal examples of ICS being copied by artisan manufacturers.

New distribution models have created new job and income generating opportunities across the supply chain, although some of those created have not been sustained as businesses adjusted models after the initial pilot.[58] However, positive examples include:

- Dev Solaire changed from a retailer to importer-distributor / retailer with shops in urban areas and using sales agents (overseen by a manager) in rural areas;
- Altech expanded its outreach to consumers by recruiting ambassadors responsible for direct sales, which it pays a commission depending on the number of sales and total cost of subscription. It currently has 1,600 ambassadors (of which 25% are women) who are paid on commission, growing from 165 in 2015. Ambassadors are usually part time and have other jobs such as shop owner, hairdresser, and salaried employment working for non-government organisations.
- Manufacturers and distributors pay trades such as electricians to install home solar systems.

Sales agents and ambassadors are paid on commission, which is calculated on the number and value of sales. Élan advocated for permanent employee contracts with at least one business, who found that it costly as they had to pay employees full salaries despite low sales. Another business also reported adjusting remuneration arrangements to mitigate high turnover among sales agents.

New opportunities have also been created for females in sales agent and ambassador roles as businesses sought to target female consumers, although female participation in some jobs in the sector are low.[59] Some businesses have hired females finding they are more reliable than other employees, such as youth.[60]

In some cases, **unofficial resellers may have materialised[61]**. These are individuals that buy multiple products at the consumer price to resell to others, in which case they would add a margin to the price purchased, thereby making it more expensive than if bought directly from the manufacturer or distributor but potentially reaching locations that the business would not. This is an additional, but unexpected, positive income generating

[57] DSU key informant information.
[58] There is insufficient information on the numbers of jobs and income generating opportunities created and the degree to which they have been maintained.
[59] See Power for All (2019) for further research on jobs in the sector. The types of jobs created by Élan's partners seem in line with experiences elsewhere. Power for All note that pico-solar appliance and SHS companies are currently the job engine of the decentralised renewable energy sector, though employment from mini-grids is likely to grow, match and potentially exceed standalone solar in some regions.
[60] DSU key informant interview
[61] Some businesses noted they may have unofficial resellers.

opportunity for individuals acting as informal resellers. But the gain to resellers is equal to loss from customers, who are paying over and above the retail price for their product.

New business management and marketing practices

To increase the reach of quality solar products to poor consumers, Élan introduced many local businesses to new marketing and sales techniques. Through training[62] Élan introduced new techniques including direct marketing campaigns, using sales agents to reach deep into communities and conducting consumer awareness campaigns. Some businesses reported moderate to high satisfaction with the marketing campaigns conducted in 2015-16 (although some also reported no or little impact on sales). Most customers hear about products directly from sales agents or their contacts.[63] Feedback on marketing campaigns included: decreasing the geographical scope of the campaign and working in locations where businesses already had some visibility; ensuring the budget was appropriate to the scope of the campaign; the importance of all parties implementing activities according to agreed schedules; and working more closely with partners to develop and implement.

Élan supported some businesses also with human resource management including remuneration arrangements for sales agents, ambassadors and staff.

Élan also supported one business development services firm in the Kivus, La Différence[64], which included providing ongoing support to Altech that included a loan.[65] The benefit of this ongoing support has likely helped Altech's growth.[66]

While most businesses perceived new marketing practices as contributing to increased growth, adoption of these practices has been mixed contrary to assumptions underpinning Élan's theory of change. **Businesses that continued to invest in marketing appear to be those who sell products under their own brand,** a practice which Élan did not appear to anticipate. This however reflects trends in other countries[67]. The problem for businesses that distributed products from other brands was that marketing was seen as benefiting "free-riding" opposition companies[68]. Three local businesses[69] selling products under their own brand continued to invest in marketing (.

[62] Management training was conducted in 2015-16; training for female sales agents and ambassadors was conducted in 2020; and marketing campaigns run in 2015-16 with local businesses and 2018 with international businesses.
[63] For instance, in Altech's pilot in the Lusenda refugee camp, less than 1% of customers heard about the product through loudspeaker announcements. Altech's customers interviewed by DSU in May/June 2021 found out about products through Altech representatives or and ambassadors.
[64] Earlier called EPD.
[65] The founder of La Difference has since become the chair of Altech's board.
[66] It is not clear why Élan only supported one business with ongoing business development services. It may be that there were few service providers available in the locations where businesses were operating (La Difference and Altech are both based in the Kivus; whereas other partners like Dev Solaire are based in Lubumbashi, Katanga province) or support would not be effective for other businesses. .
[67] See GOGLA (2020). Off grid solar market trends report that states: "Non-affiliate [non GOGLA] manufacturers and unbranded products are firmly established in the market, representing the majority of pico sales. Non-affiliate manufacturers are also expanding their offerings to focus on designing their own brands, in some cases distributing directly to the market. This increased competition has driven down prices and made products more affordable, particularly small pico products that serve as an important entry point for many users to OGS products." (page 45)
[68] DSU key informant interviews
[69] Altech, Dev Solaire and Eco Mwinda. Dev Solaire and Eco Mwinda worked with manufacturers to produce products under their own brand; Altech's brand is on Omnivoltaic products.

These companies have either worked with manufacturers to produce products under their brand (or negotiated with manufacturers to add their brand to products. This change could signal a deeper interest and commitment to quality products and services.

Some businesses reported selling lower priced products that are 'certified'[70] but do not meet the Lighting Global standards. One interviewee described them as 'slightly less good, but just as good performance'[71]. This does not appear to be a change that Élan anticipated, but one that gives consumers more choice.

Élan recognised that the number of poor people local suppliers could reach would remain limited, and shifted focus to partner with international business with greater capacity. This decision was influenced by the numbers of beneficiaries FCDO (then DFID) expected Élan to reach by the end of 2018.[72]

Improved manufacturing of improved cookstoves

Élan also supported the improved manufacturing of improved cookstoves, largely through co-funding the purchase of equipment and providing technical training and knowledge exchanges. These aimed to improve product quality and reduce costs. Élan's interventions in the ICS sector have been less successful at changing practices, although it concentrated its resources on the pico solar sector. Only some of these businesses have continued – at least Halt Bank and Bascons. FLOW only manufactured ICS for three weeks before they closed.

Attracting international companies to DRC

Initially, Élan assumed that working with local businesses would be sufficient to reach the number of targeted beneficiaries[73], but after 12-18 months expanded its approach to establish partnerships with international suppliers.

Élan's strategy of supporting more international suppliers to enter DRC has increased competition in the market, which has served to increase consumer access to,[74] and choice in, quality solar products. In the solar sub-sector, Élan supported d.light, BBOXX, Greenlight Planet and Baobab+[75] and in the cookstoves, Burn Manufacturing. Of the five companies, d.light and Burn Manufacturing continue to sell to importers/distributors but no longer operate in DRC; Greenlight Planet has recently established a key distributor relationship and Baobab is at an even earlier stage of market scoping. Élan also expected that d.light and BURN Manufacturing would start local manufacture in DRC once sales had increased sufficiently but as noted this did not materialise.

Therefore, Élan's support to BBOXX is most notable although it came after BBOXX had already entered DRC through support from the Shell Foundation with FCDO funding[76]. BBOXX previously operated in the DRC through a partnership with established local

[70] Information on who certified and to what standards was not obtained from interviewees.
[71] Key informant interviews; Detailed information on differences in quality was not obtained. See Section 4.1.1 Policy for more discussion on standards.
[72] Élan programme documents
[73] As outlined in Élan's logframe.
[74] Élan (2016). Annual Report
[75] In mid-2021 Baobab+, part of the Baobab Group, advertised for a CEO in DRC.
[76] Élan programme documents; DSU key informant interviews.

distributor networks to sell solar home systems.[77] Élan's funding provided BBOXX with some working capital for conducting pilots in North and South Kivu to sell solar home systems through a new vertically integrated model with its own sales agents selling products using a PayGo technology platform. It also provided BBOXX with additional time to build its information of sales and profits in the DRC, which it used to improve its attractiveness to investors. Since the pilot, BBOXX has considerably increased sales, expanded to three new locations[78] and increased number of sales agents.[79]

The next section 4.1.3 has further information on Élan's partners who have obtained financial and non-financial support through multiple donor-supported avenues.

[77] BBOX had partnerships with Orange Energie and Trust Merchant Bank. FCDO also provided funding through the Shell Foundation to help BBOX establish themselves in the DRC market The partnership with Orange Energie was for the west region only.
[78] Tanyanika, Tshopo and Haut-Uele
[79] DSU key informant

4.1.3 Resource Flows

Resource flows concern how money, people, knowledge, information, and other assets such as infrastructure are allocated and distributed in the sector. It also relates to the extent of market actors (government and private) plan, commit and make investments.

In the context of this study, **Élan sought to influence resource flows in two ways**, through:

- **Its co-funding approach** which required businesses to invest in the sector, which was then expected to stimulate further investment by businesses.
- **Supporting interventions to increase the availability of finance for businesses and consumers** *(Élan 1.0 – MSC 7.3: Banks provide SMEs and consumers with adequate financial products; Élan 1.2 – MSC RE2 – Financial institutions fund DRC RE companies and consumers).*

Additionally, as outlined in Section 2: Background, President Tsheskedi committed $5m to the renewable energy Mwindi Fund in early 2021, an initiative to raise $500m by 2024 for rural energy access. Élan reports that its work with ACERD influenced this commitment.

Businesses' investment in the sector

Through its partnerships with businesses, Élan has influenced businesses to invest £2.3m into marketing, piloting new business models and increasing distribution networks. This is 61% (or £3.75m) of the total partnership agreement costs, but excludes Élan core, programme development and overhead costs. Most (83%) of partners' investment was in the solar sector, as was Élan's (74%). For ICS interventions, partners generally invested less at around 50% of the total intervention budgets. Local businesses also invested proportionately more than international businesses. Further information is available in Annex 7.

Continued investment in inventory is evidenced by the increases in sales mentioned above (see section 1.2).

Access to finance for businesses

Businesses' access to finance remains limited and a significant constraint on market development. **There have been minor improvements for a few businesses' who have secured international equity and debt investments or secured inventory on credit.**

Élan initially thought that local banks would provide working capital to renewable energy businesses, but they have not stepped in to fill businesses' financing needs despite Élan's efforts. Reasons for the lack of success are not clear although interviews with Élan staff and renewable energy businesses noted several constraints, most of which have been noted in earlier programme reports, which principally relate to banks' risk appetites. The cited reasons include:

- Businesses cannot meet the very demanding collateral requirements set in legislation;[80]
- Banks lack knowledge of the renewable energy sector (including solar) and PayGo business models;

[80] The high collateral requirements were not identified as a key constraint in Élan's early market analysis. Information on Élan's activities to address this constraint are not clear, although we believe Élan tried to use collateral management agreements (warehouse receipting) for solar products, as they did in the agriculture sector with grains. However, information on the activity and outcomes is unavailable.

- Too many actors are involved in arrangements such as guarantees making it too complex;
- Foreign exchange risks.[81]
- Staff are risk adverse even when working for international banks, such as the Kenyan Equity Bank who purchased Pro Credit Bank, that have experience in new sectors and business models.[82]

Information on the profitability of the renewable energy businesses is not available and the degree to which profitability in the sector affects banks' perceptions of risk is not understood. Several businesses noted they were satisfied with their growth and Élan believes the PayGo model is profitable, but the management of cash flow is challenging.

Based on its experience with local banks, Élan changed its attention to larger importers and distributors to provide credit to local businesses. Élan provided credit guarantees to manufacturers intended to build trust between manufacturers and local distributors.

Based on interviews, **international pico solar and SHS manufacturers have not continued providing credit to local businesses after Élan credit guarantees ended**. Most interviewees reported no change in payment terms.[83] However, interviews highlighted examples of local importers, distributors and manufacturers providing credit to other businesses, such as resellers or distributors, in their supply chain. Some reportedly did so before Élan and have continued to do so, while others did prior to Élan and have since stopped.

Élan 1.2 then turned its focus to the international investment community, particularly impact investors, to address the constraint. It held a two-day investment conference in mid-2019 with over 100 participants.[84]

Élan reported that its support to Altech and BBOXX resulted in US$5 million of long-term capital investment, stressing the significance of this given investors' risk perceptions of DRC. It is not possible to determine the strength of this claim due to a lack of evidence and both these businesses already received support from multiple avenues. It is more likely that Élan's support to Altech aided its growth that eventually helped it to secure investment from Persistent Energy and via platforms like Trine and Energise Africa, among others.[85] Élan's support to an international company like BBOXX is less likely to have been influential. The extent to which other local businesses have sought international investment is not clear, although some businesses noted they rely on internal funds.

Information on investment into ICS businesses is not available[86].

Importantly, **most of the investment that has been secured is either going to businesses that only sell solar home systems or investment is linked to solar home systems**, such

[81] DSU key informant interview
[82] DSU key informant interviews. One interviewee noted Equity Bank was still managed by Congolese staff without the experience and exposure to the sector needed to change practices. Several DRC banks have partnerships with multilateral development banks and development finance institutions who are interested in increasing access to finance for SMEs and poor consumers.
[83] DSU key informant interviews. One interviewee noted they were able to secure improved payment terms that included making repayments once sales had been secured.
[84] Élan (2019). Event report. No information is available on the outcomes of the conference.
[85] See here and here. Tetra Tech (2020) note that small local off-grid solar companies who typically have fewer years of experience and less market traction, struggle to raise financing compared to larger regional players.
[86] No information was provided by interviewees.

as Trine's first loan to Altech.[87] The degree to which investments will benefit FCDO's target group, either directly or indirectly, e.g. supporting businesses' growth enabling them to still serve poor consumers, is not yet known.

Some interviewees stressed **the importance of improving the availability of local affordable financing, noting it was important for a self-sustaining sector.** The lack of availability may signal local bank's risk appetites (as discussed earlier) and/or that businesses are not yet profitable enough to attract local commercial investment. As is the case globally, some businesses also prefer international funders' 'free' grant funding or who lend on better terms e.g. lower interest rates[88]. For instance, BBOXX withdrew from a World Bank initiative because RawBank asked for a very high guarantee and BBOXX could obtain lower rates overseas.[89] It is likely international businesses will still have better access to finance than local businesses. Research[90] of investment into African off-grid solar businesses has also found that small local off-grid solar companies who typically have fewer years of experience and less market traction, struggle to raise financing compared to larger regional players with access to foreign lines of credit. Additionally, investment in neighbouring countries like Kenya is almost exclusively going to businesses developing PayGo solar home system and mini-grid technology.[91]

Donor's support to the renewable energy market is notable and has grown since Élan commenced. **Élan was an early supporter of several local businesses, which have may helped businesses access to other sources of support particularly where businesses demonstrated they were able to successfully deliver according to partnership agreements.** Key supporters include USAID's Power Africa programme; World Bank, GiZ, UNCDF (particularly on cookstoves), Propaco, IFC as well as non-government organisations and foundations such as SNV and Shell Foundation. Most of Élan's partners work with these types of organisations and there is a complex network of criss-crossing relationships between businesses and multilateral and bilateral organisations, philanthropic and non-government organisations, investors, and fund managers. See Box 3.

This is important because it indicates that the performance of, for instance, Altech should not be attributed solely to the Élan programme. Altech's growth has been achieved with support from many sources. Similarly, these multiple lines of concessional finance make it difficult to assess the sustainability of the firm as an enterprise, without public subsidy. It is also difficult to determine the affordability of products to poor consumers since results based financing is used to subsidise prices or enable PayGo operators to extend credit for longer periods at reduced monthly costs.

Box 3: Examples of support to renewable energy businesses

- Altech has also been supported by UNDP, UNCDF, and Korea Carbon Management[92]; Its investors, Trine and Energise Africa, and the SIMA Angaza Distributor Finance Fund.[93]

[87] See Trine website: 'This first loan to Altech will finance close to 3,000 solar home systems, targeting the peri-urban and rural population of the Democratic Republic of Congo (DRC).
[88] Information on the cost of capital is not available. However, Altech's loan from Energise Africa was advertised as aiming for a 7.5% return. Altech also has a 12 month grace period before repayments start.
[89] DSU key informant interviews
[90] Tetra Tech (2020).
[91] Sanyal, S., Chen, C and Caldwell, M. (2020).
[92] See media reports here and here; Altech (2021). Final report to Élan
[93] See Angaza website

- BBOXX is supported by the Shell Foundation; USAID; IFC; and the World Bank Multilateral Investment Guarantee Agency and CDC (the latter two via the African Infrastructure Investment Fund 3); The Off-Grid Energy Access Fund (whose investors include KfW, European Commission, African Development Bank and supporters include USAID, FCDO and Shell Foundation)
- Greenlight Planet receives investment from CDC, FMO and Norfund along with impact investors ResponsAbility, SIMA Funds, Symbiotics, Global Partnerships, and private equity firm ARCH Emerging Markets Partners' Africa Renewable Power Fund[94]. The Sima Fund investees include: d.light, Mkopa, Omnivoltaic and BBOXX and investors include both USAID and the US's International Development Finance Corporation.
- Baobab+ by Proparco and Power Africa.
- Eco Mwinda and Altech received funding (results-based financing) from World Bank in DRC.
- Halt Bank was supported by GiZ prior to Élan and since has secured support from UNCDF to implement a project.
- The World Bank supported Biso na Bino and Bascons on ICS manufacture and distribution.

Access to finance for consumers

Initially, Élan planned to incentivise local banks and financial institutions to offer loan products to low-income consumers. When this was not successful[95], Élan pivoted to supporting local businesses (such as Altech, Dev Solaire and Eco Mwinda) to pilot the PayGo business model (described in Section 4.1.4). Élan also co-funded interventions with ICS manufacturers and local banks to increase access to finance for consumers, but these were also not successful.

Only a few businesses provide consumers with credit for products, like lanterns and ICS, that are most affordable to poor consumers. However, some businesses also provided credit before they worked with Élan[96]. Credit appears more readily available for more expensive solar home systems, although sometimes credit may only be provided for a short term. PayGo operators appear to offer longer repayment periods.

Élan has contributed to the adoption of PayGo in the DRC market. Before Élan commenced, no companies in DRC were using the PayGo system. This situation changed with the entry into DRC of BBOXX who were already using PayGo and brought this system with them (See Box 3). Élan also actively supported Altech, Dev Solaire, and Eco Mwinda to pilot PayGo for solar[97], and Altech also for ICS. However, only Altech has continued with the PayGo model which it uses for lanterns and solar home systems. Working capital requirements was the key reason for not continuing with the model post-pilot. Élan also discussed adopting the model with at least one additional local business who did not want to adopt it as they did not see it was feasible for them, and Élan did not want to support the businesses idea. BBOXX only sells solar home systems.

The PayGo model is expected to transform the market by increasing consumers access to credit and critical to addressing affordability constraints, according to some

[94] See CDC website and Sima Funds website
[95] Information on why Élan's efforts were not successful is very limited.
[96] DSU key informant interviews
[97] Lending, internet and mobile money transaction costs along with higher risks mean it is not profitable to use PayGo for smaller products like lanterns (Sotiriou et al, 2018).

interviewees. In 2019, GOGLA reported that 45% of all certified products sold by their member businesses in DRC was through PayGo. By the second financial reporting period of 2020, the number had risen to 54% of all sales. Most of these sales are estimated to be by BBOXX and Altech.

Box 4: What is pay as you go?

The pay as you go model emerged around 2013 as companies selling solar lanterns, kits, and home systems to off-grid (or weak-grid) customers realised that they needed to find an efficient way to spread the cost of their devices over time if they were to be affordable to customers in Africa and Asia. Technology solutions allowed products to be purchased in instalments like mobile phone air-time top-ups or paying for charging services. Two models currently exist: 1) customer pays for energy services but does not ever own the solar system itself; 2) solar system is paid over time and ultimately transferred to the customer. In 2018, 90% of global PayGo sales are on lease to own arrangements.

Solar home systems are typically financed over 12–36 months, with the user making a down payment of 10–20%, and then using mobile money transaction or paying directly to a sales agent or ambassador to buy "units" of energy service in whatever amount they choose (daily, weekly, monthly). If those units run out, the system automatically shuts off until credit is topped up, like a prepaid electric metre or prepaid airtime. Once the user has purchased the contractual number of units, the system unlocks permanently and ownership transfers to the user. Lenders offer different time periods for loans (up to 36 months) and flexibility in extensions to payment timelines (between 110-125% of the nominal period).[98]

PayGo companies combine elements of modern electric utilities that provide clean energy services, retailers that sell durable goods through diverse distribution channels, and financial institutions that provide leasing that makes valuable assets affordable for low-income customers. They straddle two value chains, with vertical integration within those operations.[99]

However, **other key informants remained cautious about credit**, noting the risks and potential negative impacts, including that it puts already poor people into greater debt.[100] **Credit is also unlikely to be provided to the poorest consumers, since businesses need customers who repay.** PayGo customers are more likely to earn more than non-PayGo customers[101], and have salaried jobs, such as public servants, teachers and hospital staff. Section 5 provides further information on which consumers are benefiting.

Élan has not established partnerships with telecommunication companies, an important potential actor for credit and PayGo models as customers can pay via mobile money platforms. However, BBOXX and GLP have relationships with Orange Energie and Altech with Vodacom[102]. Telecommunication companies charge businesses for each transaction, which some interviewees saw as expensive particularly on small products with smaller profit margins. However, mobile money payments could decrease costs associated with manual payment collection although there are other costs associated with integrating

[98] Irena (2020).
[99] https://www.lightingglobal.org/paygo/
[100] For more on the risks of PayGo see: Waldron, D (2018). r
[101] Élan (2018). Poverty Profiling Study.
[102] DSU key informant interviews; USAID (2019)

PayGo operators and telecommunication companies systems.[103] Most of Altech's customers in Kinshasa interviewed paid via Mpesa, although it appears that Altech-Mpesa softwares are not integrated which increases other costs.[104] Orange Energie reported that nearly 50% of their new PayGo solar customers activate or re-activate mobile money to use the service; and that among PayGo solar customers, around 25 – 30% that had stopped using GSM services previously, became active again, reinforcing the correlation between reliable charging and phone usage.[105] One ICS business also said they are looking at using payments via mobile money platforms.

[103] Information on the effect of mobile payments on business costs is not available. See here for more information on costs.
[104] DSU key informant interviews
[105] Akim Musimwa, Director of Orange Energie at Orange DRC cited in GSMA website.

4.1.4 Relationships and connections

Relationship refers to the quality of relations and communication between market actors, particularly those that may have different experiences and viewpoints. One indicator of changes in relationships are sales to consumers.

To improve distribution of products in DRC, Élan sought to facilitate new relationships and connections between market actors. This relates to:

- *Élan 1.0 – MSC7.1: SMEs produce or import highly efficient energy technologies and MSC7.2: SMEs implement innovative communication, marketing and distribution models to reach BoP households.*
- *Élan 1.2 – MSC RE1 – RE companies can serve lower income customers and new* Élan *areas*

It also sought to create new relationships in order to address a key policy constraint *(Élan 1.0 – MSC 7.4: SMEs advocate for more favourable tax regime).*

This section describes some of the key changes in relationships between actors, Élan's intervention to influence this and Élan's contributions.

Business to business relationships

The development of new business to business relationships has been core to the development of DRC's quality solar product market. Élan efforts helped to establish new relationships between international manufacturers and local importers and distributors (See Box 4).[106] These do not, however, appear to have improved the terms of payments for most local importers and distributors, something Élan expected.

The potential opportunity in the DRC, due to its large urban population and low electricity coverage, would likely attract new entrants over time. However, **Élan used its market knowledge and networks to encourage new entrants, and therefore speed-up their entry**. International businesses found Élan's knowledge of the market, including donors and donor-funded programmes, very useful.[107]

Box 5: Making connections – examples

Prior to Élan Altech sold d.light products. [108] Élan facilitated Altech's relationship with Ominvoltaic to gain access to the latter's PayGo technology-based products that use Angaza software and negotiated with Omnivoltaic to use its own brand[109].

Altech and BURN Manufacturing, also an Élan partner, connected to sell ICS on BURN's exit from DRC.

Élan facilitated Dev Solaire's partnerships with d.light and GLP to import their products, although these only lasted for one shipment each, and Dev Solaire then established new relationships with other manufacturers.

[107] DSU key informant interviews; Élan programme documentation.
[108] Altech also sells Ruralspark products (Netherlands).
[109] These were two key reasons for Altech's change in manufacturer. D.light is now produces PayGo products enabled with Angaza software.

Élan provided Greenlight Planet with introductions to local market actors and conducted market studies for Greenlight Planet and Baobab+.

Business to consumer relationships

Examining sales volume and value is one way to understanding relationships and connections between businesses and consumers. Sales volumes and values are increasing, but values increasing much more than volumes indicating that SHS make up more sales than pico solar.

We have analysed available sales data from two sources, Élan's files and GOGLA annual reports for the DRC. Our analysis is outlined below with several caveats.[110]

Between 2016 and 2020, sales in the DRC of pico solar and SHS certified to Lighting Global standards and manufactured by business affiliated with GOGLA, increased by 43% (74,000 in 2016 to 105,000 in 2020) and estimated market value nearly 1300%, from $912,000 to $12.5m in 2020. Annex 11 contains more detailed information on the GOGLA data and analysis.

The higher rate of revenue growth likely indicates that higher-priced products are making up a greater proportion of sales among GOGLA affiliates. The average value of sales in 2016 was $12.35 and in 2020 $118.29. Therefore, over the period of Élan's support to the sector importers and distributors (Élan partners and others) have moved from selling lower priced lanterns to more expensive solar home systems, which are unaffordable to the poor.

Based on partial sales data from some of **Élan's partners, sales have grown by approximately 200% between 2016 and 2020**, with higher levels of growth occurring during Élan's support. This is far greater than the 43% increase in sales reported by GOGLA of its affiliated businesses. Differences could reflect that the data collected by Élan is from better performing partners, but it may also reflect greater growth among ÉLAN partners who are not considered a GOGLA affiliate e.g. Dev Solaire.

So, Élan's partners that are affiliated to GOGLA are more likely to sell more expensive products, while non-affiliated partners are more likely to serve the target group.

It is estimated that sales by businesses not affiliated with GOGLA might be 272,000 in 2020 or about 60% of the market so the total sales volume for pico solar and SHS in 2020 was around 380,000. It is estimated that Élan's partners may have about a 20-30% market share in 2020

Information on the degree to which there are sufficient incentives to sell products to poor consumers presents a mixed picture. While businesses may sell more smaller

[110] It is difficult to fully reconcile the two sources as Élan's partner sales data is incomplete and the distinction between lanterns sales versus SHS is not always clear, while GOGLA data is only from manufacturers who are their members and if insufficient manufacturers submit data, GOGLA does not report to maintain confidentiality. GOGLA does not capture sales information from businesses it is not affiliated with. However, it estimates that non-affiliated pico solar have 72% and 50% of SHS of the market share globally.

products, larger products contribute disproportionately to revenues and profitability.[111] Some of Élan's partners no longer sell products affordable to poor consumers.

With the introduction of product warranties and consumer credit, the relationship between businesses and customers are also changing.[112] See Section 4.1.5: Power Dynamics for further discussion on these relationships.

Business – donor relationships

Donor support to the sector influences sales growth. There are notable fluctuations in GOGLA-reported sales volumes year to year with significant increases from 2016 to 2017 and then notable decrease from 2017 to 2018. The 2017 increase is driven by lantern sales, but it is unclear if this was influenced by Élan. GOGLA reports in 2019 and 2020 note the influence of World Bank and USAID activities on sales in DRC.

See Section 4.1.3: Resource Flows for examples of donor funding to pico solar, SHS and ICS businesses.

S**ome businesses noted that their reputation was enhanced by their work serving lower income groups.** One business interviewee stated 'We are happy with the story that we have been able to create', implying that the story of selling products to some target groups was regarded well by international organisations such as donors and investors.

Industry relationships

The outcomes of Élan's efforts between 2018 – 2021 to set up the industry association, ACERD[113], to build networks across solar businesses to lobby for shared policy objectives, is yet to be seen.

ACERD's role is to promote sustainable development through the products and services offered by its members and to support the growth of the sector for the benefit of the Congolese economy and people. ACERD aims to be the voice of the sector in national and international forums and:

- Improve the regulatory and fiscal environment to support growth of the sector
- Engage with government in the development of policy to integrate renewable energy into the wider development of the DRC
- Encourage further investment in the sector to increase access to power for the Congolese people.[114]

Building trust across ACERD's 30 plus member organisations has been challenging. While the potential benefits of the association are well recognised[115], several members see ACERD's larger business members as unfairly benefiting from: (a) holding ACERD leadership roles that help them establish relationships with government agencies through which they can use to obtain advantages such as exemptions; and (b)

[111] Based on a limited set of sales data available.
[112] DSU interviews with Altech customers.
[113] In 2021, ACERD had at least 30 members. Some businesses were also members of the Federation des Enterprises du Congo (FEC). A sector specific business association was favoured over joining a specific sub-group under FEC as hydro players tended to dominate. However, solar renewable energy companies tend to be smaller and therefore has less influence with government[113]
[114] Élan programme documents

the promotion of certain business models e.g. those that use PayGo and/or mobile money payments, which are less feasible for smaller businesses.[116] ACERD is not yet fully taking on its new roles as some members also see that donor organisations continue to lead discussions with Government.[117]

[116] DSU key informant interview. As one interviewee noted ‘‘if one if lobbying on their own, it is difficult to get anything done’. Interviewees identified other problems with ACERD.
[117] DSU key informant interviews. While they saw ACERD as having sufficient financial resources (membership fees are $3000 per annum) human resource capital was seen insufficient. Overall, members see ACERD being used to promote the interests of certain individual actors rather group interests.

4.1.5 Power dynamics

Power dynamics refers to the distribution of decision-making power, authority, and formal and informal influence among individuals and organisations.

This study is interested in:

- the extent to which market actors have a choice between different types of products, qualities, prices; and the level of constraint on powerful from exploiting their position.
- the terms on which targeted beneficiaries are organised and participate in markets (as workers, consumers, producers, business owners) and the extent to which the terms benefit targeted groups.

Consumers' choice of products

Élan's support to businesses has likely increased consumers' choice of pico solar and ICS, although the degree of choice differs by locality and consumers' purchasing power. The choices available to low income consumers are not likely to have increased significantly.

Prior to Élan's commencement, consumers' main choices were low-quality Chinese lanterns and d.light lanterns and d.light was only distributed in the Kivus. Today there are a greater choice of brands, although functionality remains similar, across more urban areas.[118] In Kinshasa, the Altech customers interviewed described solar products as 'popularised, and more readily available than they were five years ago, either through shops or due to sales agents reaching out to communities and work places.[119] Élan has contributed to this change through co-funding new and expanding distribution networks. Businesses have adapted product ranges to attract customers with varying purchasing power[120] and expanded into new product lines – although these are relevant primarily to the top-end of the consumer market.[121]

Orange Energie, who Élan did not partner with, operate a leasing model whereby customers subscribe to a service with monthly payments but never own the product. Based on interview information, Élan's partners have not adopted subscription models.

Consumers also have more choice in different levels of quality products with warranties. Élan supported the importation and distribution of better quality products, initially those quality verified to Lighting Global standards, differentiating them from the low-quality 'Chinese' lanterns.[122] Two businesses adapted this approach by distributing quality verified products according to other standards, thereby providing consumers with

[118] DSU key informant interviews; DSU interviews with Altech customers
[119] Based on a limited number of interviews with Altech customers in Kinshasa that customers buy from ambassadors and do not necessarily compare brands, thereby not taking advantage of choices that may be available to them. This highlights however the effectiveness of distribution models that reach out to consumers.
[120] Key informant interviews. One business estimated 90% of their solar lamp sales were to poor consumers, while another estimated 15% of all products they sold were bought by 'lower income' consumers.
[121] Key informant interview. For instance, BBOXX is looking at liquefied petroleum gas and Altech at eco-charcoal distribution.
[122] Élan (2018b). Élan (2019)

a third quality tier.[123] This is a trend that is also seen in other countries, where the increased fragmentation of the pico market has meant that GOGLA affiliate companies (like the international businesses Élan partnered with) are struggling to compete with lower-priced non-affiliate products.[124]

While warranties are now common, customers do not necessarily use them.[125]

Affordability

Affordability remains a critical constraint, and is recognised by all interviewees. In a recent study in Bukavu and Goma, Élan found that:

- 44% of people interviewed did not use solar products claimed they could not afford Altech products, of which a lantern is the lowest priced at $50 cash or $59 on credit.
- 37% of people who said they had used solar products but abandoned said they did so because they could no longer afford repayments.

The study did not determine if consumers could afford other less expensive products.

Globally, the cost of manufacturing has gone down, and for low-quality products costs have decreased more. Costs have also decreased more for SHS than pico solar.[126]

Products are available across a range of prices, between $4 – 50 for smaller products, such as lights, torches, mobile phone charging and small batteries with radios, while solar home systems range between $100 - $1000. Some businesses are now selling lower priced products, but prices for other products have increased. For instance, the 2018 Mid-Term Evaluation noted the cheapest PayGo lanterns were $35[127] and in 2021 they are $59[128]. The reasons for price changes are not known.

Businesses, such as Altech, who were not originally selling solar home systems are now doing so.

Box 6: Some businesses no longer sell products priced for poor consumers

After three partnerships with Élan (2015, 2016 and 2017), Eco Mwinda no longer sells solar lanterns. Rather it uses technicians when needed to install larger systems[129], such as solar panels, batteries and solar generators, which it started selling in 2017, which are not affordable to poor consumers.[130]

[123] It was understood from interviewees that Lighting Global had the most stringent standards and the most recognised. However, there were other standards in use. The names of these were not determined. The term mid-quality here denotes better quality than the 'Chinese' lanterns but not quite as good as the Lighting Global quality verified products.
[124] GOGLA (2020).
[125] Some Altech customers interviewed had previously bought 'Chinese' lamps and noted the difference was in the quality of Altech's products, but for most customers it was their first experience with solar products. The majority were satisfied with the quality. Four customers had experienced problems with their products, of which two had contacted Altech to get the product fixed or replaced and were satisfied with this service. In one case a technician had not responded to a request for assistance
[126] GOGLA (2020).
[127] DSU (2018).
[128] Élan (2021). Programme documents. Altech was selling the Omnivoltaire L190 for $40 in 2018, compared to $50 in 2020 when paid in cash and $59 on credit in 2020/21. One interviewee noted that it was 'easy to make a big margin with solar home systems, even if they are not in constant demand'
[129] It piloted sales agents with ÉLAN's support.
[130] DSU key informant interview

Kit4Africa now only sells kits that may include fridges, televisions, and large home systems such as water heaters, water pumps and solar panels.

Élan supported Altech to bring in the d.light A1 into the market, which it considered affordable to poor consumers compared to the d.light S2 that Altech was already selling.[131] By 2018, Altech was no longer selling the A1 product.

Many businesses interviewed mentioned the difficulty of making a profit on smaller items such as lanterns.[132] Élan understood that businesses needed sales of products aimed at low-income consumers to be profitable, even if this was less profitable than products aimed at other segments. A greater volume of sales to low-income consumers was expected to be a counter to a lower profit margin.[133]

Access to credit and credit terms

The availability of credit and the terms on which it is provided is a signal of the power dynamics between the credit provider and the consumer. This relationship is still developing in the DRC as businesses adjust variables to address affordability constraints while also mitigating repayment risks.

Since Élan commenced there has been an increase in the availability of credit for some consumers, particularly those in salaried employment, but choice in credit providers is limited since local banks do not provide credit.

Only a few businesses provide consumer credit due to working capital requirements and concerns customers will not repayment loans, and those that do mostly provide credit for solar home systems. Altech seems to be an exception and provides credit for a lantern.[134]. Halt Bank provides credit for ICS that cost $20.

Solar home systems are likely to remain unaffordable to poor consumers since they are more unlikely to meet credit criteria. Consumers with regular salaried incomes (around $1979 per annum; $5.42 per day) are more likely to be credit worthy. Élan expected that some households would be able to use savings from replacing non-renewable fuels with renewable solar power to pay-off the price for the product purchased on credit, but this is more likely feasible for non-poor households.[135]

However, businesses in the solar and ICS sectors continue to adjust variables (amount of the deposit, length of payment plans and frequency of payments) to find the sweet spot in terms of consumer affordability, cash flow and risk. [136] For instance, more frequent payments may decrease cashflow challenges but longer repayment periods may increase the affordability for lower income households. Longer repayment period also increases the cost of capital, increases credit risk, and makes it

[131] Élan programme documentation (RE05)

[133] DSU key informant interview

[134] Enea Consulting (2015). In 2012, it was estimated that nearly 53m people in DRC lived below the international poverty line of $1.90 per day. Over the last five years, the average GDP per capita increased slightly to $556 (2020), and $1,979 (2017) for those in salaried positions (World Bank data). Poor consumers (those living below the international poverty line of $1.90 per day) can afford and are willing to pay $30 for solar lanterns.

[135] USAID (2019).

[136] DSU key informant interviews

more challenging to retain customers. It also increases the final price as these costs are passed on to consumers.[137]

Box 7: Examples of adaptions to consumer credit terms

In 2019, BBOXX sold solar home systems and typically required a $50 down payment (around 10%). Based on Élan programme documents, Altech was selling the Omnivoltaire L190 for $40 in 2018, compared to $50 in 2020 when paid in cash and $59 on credit in 2020/21.[138]

Altech's initial PayGo offer was based on monthly repayments, but Altech changed this to daily to better manage cashflow. Altech provided credit for solar home systems for 24 months in 2018 but increased this to 36 months by 2021.[139]

Repayment rates appear satisfactory to most businesses and at least some consumers can pay ahead of schedule.[140] Less expensive products, such as lanterns, generally require a deposit of around 30% and have short repayment periods.[141] Élan reported repayment rates for the Altech pilot in 2016 were 95%[142]. The PayGo technology, which allows businesses to turn off units if customers do not pay, is seen to help businesses influence consumer repayment behaviours. Businesses found that direct and frequent contact with customers was necessary to collect credit, added to their costs, whereas the PayGo technology helped consumers to learn about credit and repayments. [143]

Small regular payments may be the only feasible option for some consumers even though credit increases the total price[144] but it is difficult to understand the interest rates charged to customers[145] and businesses are sensitive to questions regarding interest rates. All payment plans have an embedded interest rate and the only public knowledge is the monthly payments and total price. The equivalent cash price is often not known. Additionally, PayGo models usually include warranties and some level of customer service that may increase prices as well as intellectual property costs. [146] Altech

[137] See Zollman et al (2017) for further discussion of the trade-offs. They note 'There are trade-offs between profitability and affordability in the PAYGo model. This is seen in provider choices around loan tenor: longer loans mean lower monthly costs to customers, but they also come with higher financing costs and default risks for providers. Prioritising profit over scale can encourage providers to focus on higher-income customers and to incentivize agents to sell predominantly larger, more-expensive systems. Providers (and investors) who want to reach the low-income mass market will do so only if their operations and internal incentive structures align with that goal.'
[138] USAID (2019)
[139] Élan (2018); DSU key informant interview. ÉLAN's study of Altech's pilot in the Lusenda refugee camp suggested further exploration of alternative payment terms to improve affordability and manage risks.
[140] Three of the 10 Altech customers interviewed mentioned they had paid for their product earlier than the full term, indicating that credit terms are manageable. The reasons for early repayments are not clear and it is not known if they received incentives, such as early payment discounts.
[141] DSU key informant interviews
[142] Élan programme documents
[143] Élan (2016). Annual Report
[144] Key informant interview; according to one interviewee, solar products sold on credit usually cost at least $50, more than the $30 to buy the product outright
[145] It is also difficult to determine what is an acceptable interest rate. Different market actors would likely have different views. Sotiriou et al (2018) suggest that 'excessive interest rates is familiar and controversial territory in the realm of traditional microfinance' and advocate for standards that ensure interest rates are transparent.
[146] USAID (2017). See also the diagram in that illustrates the cost of financing that is built into the final price of a SHS on PayGo via an alternative bought cash.

customers reported that an L190 cost $50 cash or $59 on credit, with daily payments over 90 days. This equates to 73% annualised interest, similar to rates charged by microfinance institutions in the DRC.[147]

Box 8: Customers' perspectives on paying on credit versus cash

I didn't have the capacity to make that much money available at once. Credit turned out to be a better option … When you buy the product in cash, it costs $50, which means it costs $9 less and there is no stress of seeing your lamp not working anymore because you didn't pay. The disadvantage [of paying cash] is that you have to pay this amount at once which is not easy. The advantage of paying on credit is that you pay gradually. Even when you have a low income you can arrange to get the product. The disadvantage is the stress of the debt and the risk that the lamp doesn't work because you forgot to make the payment.

And

If you have money, it is not disadvantageous to pay cash. In fact, everyone would prefer to do that. Who likes owing people money? It is very easy to forget that you have to pay for it. But at the same time, it allows us to get the products, which otherwise, we would not have bought.

Consumer protection in DRC was described as 'embryonic'[148]. Some interviewees were more cautious about PayGo models and consumer credit noting that it is not without risks and potential negative impacts. See Box 8.

Box 9: Interviewees views on potential PayGo risks

'The pay as you go doesn't make it more affordable. It allows people to pay slower. It can be a win-win situation for both companies and consumers. In some cases, it is argued that it is even more expensive.'

And

'The big risk is that the companies that deploy it turn into bankers … The question that arises now is what percentage is applied for a product of $100 or $50. Actors are free to apply the rate that suits them best. In the end, the pay as you go model becomes a debt of the population that is already poor.'

Some of these risks to consumers could be mitigated by the other potential benefits of the PayGo model. The model provides a lot of data for businesses which could be used

[147] KfW (2011) note that microfinance institutions charge MSMEs up to 62.5% per year compared to financial institutions where interest rates range from 12 – 40% per annum depending on the purpose of the loan. Zollman et al (2017) note 'concerns remain about the impact of loans that cannot pay for themselves on the financial health of borrowers. Many PAYGo loans fall into this territory, but PAYGo loans need not have negative implications for borrowers' financial health as long as the loan is ultimately affordable, the asset produces sufficient value to the customer, the customer fully understands the terms, and the lending does not become predatory. Risks escalate in more competitive lending environments, where borrowing is more frequent and multi-layered. It is important to get this kind of lending right, because it can bring important lifestyle gains within reach—things like metal roofs, mattresses, and smartphones—for many more people, even when economic returns on these assets are small or non-existent.'

[148] DSU key informant interviews. In early 2020, GiZ organised a workshop with renewable energy companies and banks on PayGo models and was planning a follow-up workshop in August 2021. Between 2013 – 2016, GiZ provided support to the Central Bank to develop consumer protection legislation and a credit bureau but it has not progressed

to better understand customers and develop new products and services such as insurance. For customers, the model could facilitate the development of credit histories that customers can use to access finance. However, this requires numerous external issues to be addressed including: data sharing among credit providers, customer privacy and protection, regulations and adherence to the regulations that protect customers. Some businesses, mostly international manufacturers, have committed to GOGLA's consumer protection code.[149]

[149] See GOGLA website for more detail: How the principles are applied in DRC are not known e.g. whether manufacturers ensure their distributors apply the principles and whether investors require compliance of investees.

4.1.6 Mental Models

Mental models refers to norms or informal rules that underpin practices and relationships. This study is interested in mental models that affect inclusive growth, primarily those that underpin Élan's ToC, including:

- Businesses' belief that poor consumers are a credible target segment; the extent to which they develop and/or sell services products for this segment; and the degree of profitability. This includes businesses who may sell solar products as well as financial institutions who may provide loans to low-income consumers.
- Customers' attitudes towards paying more for better quality solar products.

Consumers' attitudes towards more expensive quality products

The level of consumer awareness of the value of higher-quality, certified solar products is beginning to increase from a very low base at the start of Élan. However, awareness is low and worse in rural areas.

Sales are increasing but still very small compared to the estimated market size of 6.3m. Interviews with customers say that awareness is increasing, although this may not yet equate to sales. Élan's study in Bakuvu and Goma found that not enough information about solar products was the second most frequently cited reason for not buying products.[150] Businesses recognise the need for ongoing marketing to continue building awareness.

Box 10: Interviewees views on quality versus cheaper products

The availability of lower priced 'Chinese' products means that it is sometimes difficult for consumers to accept the prices for better quality certified products.

And

Of course, people are attracted to lower quality products as they are cheaper. This is why marketing is important to build the trust and increase their knowledge on good products.

There is limited evidence to suggest that consumers are using their experience with smaller pico solar products as a test for upgrading to larger, more expensive products, including SHS, as assumed by Élan. Customer data does not currently support Élan's assumption, although there is some anecdotal evidence. For example, one interviewee commented:

> *[we] often see people buying the smaller ones [lanterns] first and then 3-4 months later buy the bigger ones. Maybe this happens because they want to test the products first to see if they work well.*

[150] Élan (2021)

Insufficient consumer demand for improved cookstoves seems to be a key reason why Élan's interventions in the sector were not successful.[151]

Businesses' attitudes towards serving the needs of poor consumers

Profitability remains key and businesses will serve poor customers if it is sufficiently profitable, although individual businesses have different views on what is 'sufficient'. More businesses are selling products to low-income consumers, although many interviewees question the feasibility and profitability of selling to consumers below the poverty line of $1.90 a day. One interviewee stated:

'…we need to be honest and recognise that the poorest of the poor will not be able to afford these solar products [lamps, torches below $50].

Most customers targeted for solar home systems are low income ($3.20 PPP per day or top 10% of population) and businesses see this as a more viable segment.[152] As mentioned in Section 4.1.2, several businesses are no longer selling smaller products such as lanterns, preferring to sell solar home systems or larger products even if the demand for these is less.[153]

Some interviewees see that subsidies are the solution to affordability issues, arguing that only if donors provide subsidies will businesses be able to sell products to poor consumers. Élan has subsidised the price of renewable energy products, most recently with Altech's initiatives with improved cookstoves.[154]

While profitability is key, enhanced reputations brought about by providing products to poor and other low income consumers are important for some businesses (See Section 4.1.4: Relationships and Connections). Attracting finance from international impact investors and support from donors is an incentive for businesses who can demonstrate how they serve either poor consumers or those without access to electricity (the later being a focus under SDG 7) may attract funding.

[151] Élan (2018) Intervention closure reports
[152] DSU key informant interviews
[153] DSU key informant interviews
[154] Élan also subsidised SHS as part of its Covid-19 interventions, but these were not market building activities.

4.2 B3: What factors have influenced the results achieved?

Sub-questions:

- What are the main factors influencing the changes in targeted constraints and market systems (policies, practices, resource flows, relationships and connections and power dynamics)?
- To what extent do these factors relate to Élan's interventions and activities?

The DRC is a challenging environment to develop markets and there have only been marginal improvements over the time of Élan's implementation. Élan focused its attention to shift some key constraints but these were largely constraints that did not relate directly to policy, regulations and formal rules. The broader environment and other unaddressed constraints continued to have a major bearing on market development and Élan's progress and achievements.

The Government's policy rhetoric broadly supports the development of the country's renewable energy market, but action largely hasn't followed the rhetoric. Legislation to liberalise the sector was enacted in 2014 but it has taken the government six years to announce leadership appointments to key agencies covered in the legislation. In 2021, the government launched the Mwinda Fund with an initial $5m investment. ACERD is said to have influenced this initiative.

An unequal playing field has materialised as a small number of businesses have secured tax exemptions. High taxes were a key constraint in 2015 and remain so. Élan's approach involved setting up an industry association after enough businesses were operational in the sector and then the association would advocate for sector wide tax exemptions. This is a lengthy pathway to change, and in the meantime businesses motivated by ways to increase profitability and grow market share have successfully lobbied for individual exemptions, something that is a negative for creating a level playing field and building trusting relationships across the sector.

Élan successfully influenced the adoption of new practices underpinned by new relationships and connections, but the availability of finance for working capital and profit margins influence changes in business practices. Businesses' growth has generally slowed in the period post-Élan support. Businesses have adjusted business models introduced by Élan to improve profitability. Élan introduced two key business models to local companies: direct sales and PayGo. Most businesses have continued with some degree of direct sales approaches. Most local businesses that Élan worked required a high level of technical assistance, more than anticipated and particularly in the ICS interventions, and as such lacked the ability to meet Élan's expectation of scale. However, Élan's support to local companies, particularly Altech and Dev Solaire, helped their growth[155].

Élan was influential in convincing local businesses to pilot PayGo, who demanded fewer risk-mitigation interventions than international businesses. Only one of the four local businesses that Élan co-funded PayGo pilots have continued, the latter being

[155] DSU key informant interviews

hampered by access to finance and increased risks. It is not clear the extent to which Élan factored in local businesses' lower management capacity, a challenge identified early on in Élan 1.0, and the support that local businesses may need to successfully operate PayGo that requires strong cash flow management. Altech's ongoing use of PayGo provides some, but still limited, competition to international PayGo operators.

Élan's knowledge of the sector improved over time and it used this knowledge to try and develop the pico solar market initially and then the SHS market. While Élan did not have an in-depth understanding of the off grid solar market when it first started, this developed and they adjusted their strategies accordingly. The entry and growth of international businesses is influenced by Élan's work but also by the actions of other funders (donors and investors) and programmes, together with the size of the potential opportunity in the DRC market. Businesses seek information and support from many avenues. Élan used their knowledge and networks to encourage international companies enter the market. Sharing this knowledge has quickened businesses market knowledge and, in some cases, also quickened entry.

Lack of programme information hamper learning what works with Élan's access to finance activities in the renewable energy sector. We do not have sufficient information on Élan's interactions with banks or investors. For instance, Élan organised a two-day investment conference in mid-2019 but the outcomes of this are not known. BBOXX secured investment from the African Infrastructure Investment Managers prior to the conference in January 2019 and credits Élan's support with giving it time to secure investment.

There is little information about why Élan's guarantee interventions were not successful. Élan perhaps underestimated the time that it may take to increase trust between manufacturers and importers, or the likelihood that manufacturers would change terms. In one instance, the payment terms offered in the financial guarantee did not meet what distributors considered acceptable or too many actors involved in arrangements such as guarantees increased the complexity of the solution and therefore risks. [156] Unlike Élan's adaptions with its work with renewable energy companies, Élan does not seem to have used these experiences to address these constraints.

Competition in the ICS sector likely affected results. This was from donated cookstoves (an issue identified by Élan 1.0 which delayed the programs intervention in the sector) and the increasing availability of cooking gas, which is preferred by some consumers.[157] However, ICS also did not provide sufficient benefits (e.g. savings) to warrant the cost.

The incremental improvements in consumer credit for pico solar have increased middle income consumers' choices. However, the lack of competition and consumer protection in the DRC limits consumers' power.

[156] Élan (unknown). Partnership Closure Report – BURN Manufacturing
[157] DSU key informant interview.

Other factors affecting results achieved

The structure of FCDO's Private Sector Development Programme also influenced Élan's approach. Compared to its partnering approach with businesses, Élan took a different slower road of creating an industry association to advocate on key policy issues with the government, rather than engaging with the government directly. There is a less direct and longer link between advocacy and Élan's impact-level performance targets, which may have helped it take a different approach. Élan's approach, however, is likely influenced by the set-up of FCDO's Private Sector Development Programme that segregated, at least on paper, working with government from working with business. While Élan recognised the general business environment was a key market constraint, it largely did not seek to influence key issues impacting the development of the renewable energy market. Rather Élan saw that working with government was a central focus of its sister programme, Essor, and businesses would be wary of working with Élan if it also worked with the government. Élan and Essor had several discussions on collaborating, but Essor did not work with government on key policy issues Élan had identified.[158]

Élan mostly partnered with businesses, of which there was a limited pool in DRC to work with. The pool of potential businesses for Élan to work with is narrowed by those interested in working with Élan and who meet FCDO and Élan's compliance and risk criteria. With such a nascent market, the size of the pool was small and over the years Élan has worked with many businesses. However, Élan's focus on better quality products certified by Lighting Global means that it has not worked with many businesses that are selling most of the pico solar products in DRC.

Performance targets for the number of beneficiaries, rather than market system changes, set for Élan influenced how it tackled constraints. Rather than continue intensive support to build local businesses' capacity, which would be likely slower to deliver results, Élan added a focus on partnering with international businesses who it believed would more easily be able to help them reach performance targets by 2018. In shifting its focus to large international businesses, it appears Élan underestimated the difficulty of getting them on board and the level of risk mitigation support that they would need, which meant that this was also a slow path to achieve the level of desired changes.

Uncertainty over the programme's future and changes in FCDO's direction disrupted progress. Due to the delays and uncertainty from DFID in contracting Élan 1.2, the project closed down its offices in Goma and Kinshasa and lost most of their experienced staff. Support to some businesses, according to interviewees, ended abruptly and they were unable to continue with some of the activities, such as marketing, they commenced with Élan's support. Élan 1.2 had to spend the inception period identifying new project staff, setting up offices, organizing trainings on fraud, safeguarding, risk management, and rebuilding relationships with Élan 1.0 partners etc. This left little time for reflection and for gathering additional data to design implementation strategies. Rather, Élan 1.2 sector strategies were developed based on past experience,

[158] Élan programme documents; DSU key informant interviews. DSU has also been critical of Essor's lack of engagement and consultation with business on critical business environment reforms.

through workshops with the consultants who had worked with Élan 1.0 and the Élan 1.2 Senior Management Team (SMT). [159]

Given the constraints in the market and the maturity of the market, some of Élan's assumptions about change pathways and the speed of change seem implausible i.e. international manufacturers would establish production in DRC; the length of time it would take to establish an association with sustainable capacity. However, this may be part of Élan's learning.

Élan has not always used lessons to improve its support. Élan 1.2 staff agreed with the findings that consumer education is crucial for adoption of solar products, but the programme does not seem to have drawn on some of its earlier lessons to implement improvements. For instance, Élan 1.0[160] found that a generic mass campaign on renewable energy products had little effect on consumer purchase of products[161]. Élan 1.2 did not support further interventions to further address consumer awareness.

The coronavirus pandemic in 2020 and 2021 have impacted on results. Élan 1.2 redirected some of its effort towards interventions in the renewable energy sector that met humanitarian needs, but did not contribute to further market development.[162]

[159] DSU (2020). Élan Annual Review
[160] DSU (2020). Élan Annual Review
[161] 2019 June Rapport Campagne Marketing Indigo KINSHASA
[162] DSU (2020). Élan Annual Review

5 Impact

5.1 D1: What improvements in income delivered to target beneficiaries, contribution to poverty reduction, and any additional or unplanned impact can be attributed to Élan?

Sub-questions:

To what extent did Élan's work result in material increased income for target beneficiaries?

To what extent did Élan contribute to unplanned or additional impacts?

This section analyses Élan's impact in terms of progress against the two inter-linked indicators in Élan's logframe: 1) the number of poor people "benefiting from" (i.e. purchasing) solar products and ICS (section 4.1.1) and 2) the amounts by which their (disposable) incomes have increased as a result (section 4.1.2). This section also examines the non-financial benefits that have accrued to customers (section 4.1.3), which are not part of Élan's logframe.

The table below provides the assessment of outcomes for the poor (See Annex 4 for further information)

Table 11: Assessment of outcomes for the poor

Outcomes	1)Beginning	2)	3)Strengthening	4)	5)Significant
	■➔	●			

In 2015, when Élan began its work in the sector, there were very limited numbers of pico solar and SHS being sold and therefore very few people, poor or otherwise, had access. 'Chinese' pico solar products were available in some parts of eastern DRC as were ICS but the latter was not a benefit delivered via a market-based approach. Rather, ICS were provided free by some NGOs and was a reason why Élan delayed its support to the sector.

By 2021, the volume of pico solar and SHS sales has increased, for both quality verified products, Chinese products and those in between. For quality verified products, it is estimated that about 63% may be lanterns[163] and half of the customers are poor. For products that are not quality verified, the proportion of customers who are poor is likely greater because the prices are lower. Despite the gains, it is estimated that a limited number of urban poor, relative to the estimated size of the market, are benefiting from the quality solar pico market.

A smaller number of people are benefiting from ICS.

[163] GOGLA (2020)

5.1.1 Number of poor people benefiting from solar and ICS products

To understand the number of poor people who have benefited from solar and ICS products requires first understanding the breadth of people reached (i.e. number of poor beneficiaries) and then understanding the significance of the benefit for the people reached (i.e. the level of poverty of poor beneficiaries).

Reported number of poor people who have benefited from solar and ICS interventions/ products

Élan reports that it contributed to 153,429[164] people benefitting from pico solar, SHS and ICS products, although mostly solar products.

Over both Élan 1.0 and Élan 1.2 it is estimated that 106,000 (or 70%) were below the $3.20 pppd poverty line and 71,000 (or 46%) below the $1.90 pppd poverty line.

Élan reported that 45% of customers in Phase 1 were women and in Phase 2, 25%.

Additional analysis of the poverty profiles of Élan's partners' customers in the renewable energy sector is included in **Annex 11**.

Solar product customers attributable to Élan's equates to around 2% of the estimated 6.3m pico solar market, indicating this new market is still at an early stage. Half of this (1%) are poor.

The majority of outreach was driven by a few of Élan's partnerships.

Beneficiaries

Élan's partners' average customer profile has shifted over a four-year period[165]. A higher proportion of customers were poor and lower middle-income earners in Élan's earlier interventions. For instance:

- In 2018, 54% of solar customers were below the poverty line ($1.90 per day).
- In 2020, the average daily income for those that purchased lanterns was $3.47 compared to $2.73 for that that had not purchased lanterns.
- In 2021, between a third and half of customers earned less than $5 per day.

Customers surveyed in later studies had access to credit, meaning they are more likely to be living nearer the$3.20 pppd poverty line.

Additionally, some customers already have access to electricity through SNEL so they are not getting a new benefit, although it might create more reliable access (see Section 5.1.3). A recently study of Altech's customers in Goma and Bakuvu found that 55.5% and 82.9% respectively had SNEL connections.

According to Élan's studies between 2015 and 2018, nearly 60% of improved cook stove customers are below the poverty line of $1.90 per day.

[164] Élan 1.0: 129,800 (85%) and Élan 1.2: 23,629 (15%). Élan's (2021b) - 25% of beneficiaries were women.
[165] Based on a comparison of three studies conducted by Élan over 2018, 2020 (Galinie, A and Bommart, D (2020)) and 2021. An exact comparison is not possible due to different methodologies used.

5.1.2 Increased incomes for pico solar and ICS customers

Élan reported that the total increase to all beneficiary's income was £9,515,674, or on average £62 per person between 2015 and 2021[166].

Over both phases it is estimated that £5m (or 53%) of this value was experienced by those living below the $1.90 pppd poverty threshold and £7.4m (78%) by customers earning below $3.20 pppd.

The use of solar and ICS products has contributed to small increases in the disposable incomes of many poor beneficiaries, but not all. These increases have primarily been achieved through household savings on energy costs between $2 – 7.50 for pico solar. The degree of savings is dependent on numerous factors including the cost of fossil energy, date of acquisition, acquisition prices, currency exchange rates, access to other electricity sources such generators, access to grid or mini-grids. Information regarding the duration of benefits is not available but GOGLA's metrics for solar assume product lifespan is 1.5 years.

Energy costs increase when pico solar is used to supplement SNEL-provided electricity. In a 2021 study, between 20 – 50% of pico solar customers reported decreased energy expenditure, with lower income households more likely to report a benefit.[167] Similarly, Élan's 2017 study in Kinshasa found savings were very influenced by the ownership of generators.[168]

Charcoal costs could be halved by those using ICS, saving customers around $10 per month. [169] Women did not always benefit from these savings as the money was not passed on by men who tended to control household budgets. In a few cases where money was passed on, women used it on income generating activities such as buying additional products for sale in shops or restaurants.[170] Many women (more than half) continued to use ICS alongside traditional stoves, even if they used the traditional stoves less often.

The depth of benefits differs across groups, and depends on numerous factors including durability and how and who uses the products.

Only 3% of pico solar customers used the products for productive purposes and only 1% of all customers increased income by using products (about $9 per month on top of $7 per month savings)[171].

5.1.3 Non-income related benefits for customers

Anecdotal evidence suggests customers value non-income related benefits from solar and ICS products. These benefits have not been quantified but include[172].

[166] The DSU (2020) completed an assessment of the reliability of reported increased income for Élan 1.0 in 2020. In the renewable energy sector, five interventions contributed a significant portion of the reported increased income. It was likely that the actual increased income was 84% of that reported.
[167] Élan (2021b)
[168] Élan (2017)
[169] Élan (2017)
[170] Élan programme documents
[171] Élan (2017)
[172] cited in Élan reports and by interviewees

- **Less disruption from main's power outages**: Most Altech customers in Goma and Bakavu have SNEL connections, so renewable energy is used as a back-up and these customers benefited from an additional 1.6 days per week of undisrupted electricity supply. There are higher levels of energy disruption in Bakavu. This was one of the priority customer segments Élan 1.0 identified in 2015[173].
- **Increased flexibility to pursue household activities[174]**: Approximately 45% of households in Bukavu and Goma reported they initiated other activities, such as cooking and cleaning and working from home (e.g. for teachers), due to the purchase of renewable energy products. In Lusenda refugee camp solar lanterns facilitated positive life-style changes for many customers.

  Benefits may differ according to customers socio-economic characteristics. For instance, customers in Lusenda refugee camp with one or more disabilities did not share equally in benefits and as such they were also less satisfied with solar lanterns than persons without disabilities.
- **Warranties**: A 2017 study by Élan[175] found 17% of pico solar and 7% of ICS did not last 12 months, and 40% of pico solar customers and 10% of ICS customers tried to get them fixed. A third of the customers interviewed by DSU for this study had made use of this facility thereby savings themselves money in either fixing or replacing products. The number of interviews conducted was small so it is not clear how representative this is.

Women saved time by using improved cooked stoves and changed cash management practices, but only a small percentage of users who saved money used it for business activities.

ICS adoption almost halved cooking time saving on average four to five hours per day, which around half the women surveyed used for additional household related activities while only 10% used time for additional productive activities.[176]

Box 11: Customers views on the benefits of pico solar

- *We can be around the table with the family and talk without being in a hurry*
- *We can cook, eat and sleep whenever we want.*
- *Because of the lack of light we are forced to prepare and eat before the darkness comes and sleep before it gets dark.*

Other studies not connected to Élan's work report note that pico solar and SHS users in neighbouring countries (Rwanda and Uganda) reported improvements in air quality in homes and health and safety due where kerosene lanterns, that emit fine particulates and toxic gases that can harm health and cause burns or fires, are replaced with solar.[177] However, Élan has not conducted these types of studies.

[173] Enea Consulting (2016)
[174] Other studies, such as Grimm et al (2016) in Rwanda found the same benefit.
[175] Élan (2017)
[176] Élan (2019d)
[177] GOGLA (2020).

5.2 D2: What factors influenced the impact?

Sub-questions:

What are the main factors influencing the achievement of impacts for targeted beneficiaries?

To what extent do these factors relate to Élan's interventions and activities?

The breadth of impact or number of poor and low-income people benefitting is affected by the degree to which market changes have materialised and the extent to which key constraints have been addressed. This is covered in Section 4.

The depth and duration of impact is affected by the characteristics of the product and how they are used, and goes to the assumptions about what impact and how much impact renewable energy products were expected to generate. See Section 2: Relevance for an assessment on the degree that the assumptions held true.

It appears that Élan's assumptions about the type of benefit and the degree of benefit that would be derived from pico solar and improved cookstoves, and particularly their contribution to economic growth via savings used for income generating activities has not held. That said products do appear, at least anecdotally, to contribute to improved living conditions. Therefore, this may be a more appropriate measure of success.

Some interviewees emphasised that pico solar is a lighting solution not an energy supply solution. One interviewee commented:

> *If one wants to develop the renewable energy sector and give access to electricity, they will not achieve it just by selling lanterns and flashlights. A small business will need something that could make the sewing machine work for example, but this will not be a radio or phone charger.*

Élan's assumptions and findings appear in line with research elsewhere in the region. See Box 11.

Box 12: Expected benefits from solar lighting and home systems

The benefits achieved by Élan's interventions appear in line with research elsewhere in the region.

For instance, in a study in Kenya, Rom et al (2017) noted that 'the effects of solar lights are welfare improving for most households; however, unsurprisingly, they do not seem to be transformational in the sense that they do not lift people out of poverty'.[178] Similarly, the Efficiency for Access Coalition[179] noted that the perceived benefits of room lighting has fallen behind benefits from solar or electric water pumps; mobile/smart phones and refrigeration for household appliances and solar water pumps; agricultural cold storage/ cold chain technologies; mills/grinders; and light commercial/SME refrigeration/freezer units for business/productive uses. Survey respondents reported much higher consumer demand for televisions and fans compared to their perceived development impact. In

[178] Rom, A., Günther, I., and Harrison, Kat (2017).

[179] Efficiency for Access Coalition (2020).

reverse, there was lower demand for some appliances with higher development impact (such as water pumps, mills/grinders, internet connectivity, and sewing machines).[180]

Zollman et al's (2017) study in Kenya, Ghana, Côte d'Ivoire and Tanzania found that few respondents financed their solar home systems by using the devices to make money via selling phone charging services to neighbours and by extending small business hours past sunset. As solar adoption increased, phone-charging revenue disappeared. In Ghana and Côte d'Ivoire, it was not socially acceptable to ask friends and neighbours to pay to charge their phones. Solar income did not play a major role in helping buyers in the study finance their investments. They also found that even when PayGo customers did not save money in the short-term (for instance while they were making repayments) they still valued the products, noting that 'For many, the primary driver of their purchase decision was not saving money, it was a lifestyle change' (page 18).

[180] Endev (2020). The focus of most productive use energy projects, as well as product development by manufacturers, is on applications in agriculture, agro-processing and water supply. This is because solar and other renewable technologies can help to optimise farming practices in areas without electricity access.

6 Sustainability

6.1 E1: To what extent have the results of Élan in terms of market systems change been sustained?

Sub-questions:

- Does there continue to be investment in project supported models and building internal operational capacity for the models?
- Do the actors have access to the necessary capacity to continue implementing the new business models?
- To what extent have changes in policies, practices, resource flows, relationships and connections and power dynamics to which Élan has contributed continued without Élan support, and been resilient to changes in market system?
- What are the key factors helping or hindering their sustainability and resilience?

This study uses a broader definition of sustainability that goes beyond whether the interventions' immediate outputs and benefits are likely to continue after interventions finish. In line with Élan's aim to influence systems change, this broader definition includes notions of market resilience; the degree to which markets adapt to shocks and other changes in a way that is responsive to poor people. Market resilience requires individual market actors to be resilient with the capacity to take advantage of opportunities and minimise negative impacts. This section looks at the degree to which the DRC solar and ICS market is responsive to the poor and responsive to shocks.

Key findings:

Élan's support to most partners did not continue into Élan 1.2, and the coronavirus pandemic disrupted some plans to further strengthen sustainability. Therefore, many partners have had to continue without support or with the support of other donors and programmes.

The market is still at an early stage of development and it is too early to make conclusions about the sustainability of some of changes that have taken place.

However, there are some indications of resilience to shocks, the primary one being the coronavirus pandemic that commenced in 2020 that has impacted on all areas of the market. While businesses largely seem to have endured this shock, it may put increasing pressure on the market's responsiveness to the poor since products affordable to the lower income persons, rather than poor, have higher profit margins.

6.1.1 Market responsiveness to the poor

Quality verified pico solar and SHS are gradually becoming more available in urban pockets in the DRC. The market is changing and becoming more responsive to lower middle-income groups, but still not very responsive to the poor.

The market for solar products that are not quality verified to Lighting Global standards is the most responsive to the poor, in that are more affordable than the quality verified alternatives[181].

The part of market that is likely becoming more responsive to the poor are the minority of Élan partners' that are selling better quality products that are not quality verified to Lighting Global standards.

There is insufficient information available on the differences in quality in DRC between quality verified using Lighting Global standards, the 'Chinese' products and those in between and if there have improvements in quality among the 'Chinese' products over time.[182]

From the information available it remains unclear what percentage of customers who obtain credit via PayGo operators are below $1.90 a day and they use their $2 – 7.50 per day savings per month to make repayments.

The market is also responsive to lower and upper middle-income persons, particularly upper middle income, who appear to have a broader range of choice in terms of affordable products (either buying cash or on credit) and more choice in terms of providers since more businesses sell to wealthier customers.

However, **the market is still at an early stage of development and it is too early to make conclusions about the sustainability of some of the changes observed.** Some market actors have made adaptions to better serve poor customers. For example, adapting products to consumers' purchasing power and offering credit based on consumers ability to pay. Other actors have moved away from poor customers. For example, shifting their focus away from solar products affordable to the poor (lanterns) to products which are more expensive and profitable (solar home systems).

The strengths of the market are the increased number and focus of Élan-supported businesses selling solar products (and to a lesser degree ICS) to poor and low-income consumers in urban areas. However, the number is less than the total that Élan worked with. It is estimated that 25% of Élan's partners in the solar sector are no longer focused on selling products such as lanterns. Businesses have expanded services to reach new poor customers in new locations, although some interviewees suggested that these businesses may not be sustained. Businesses have adopted new distribution and payment models and built new relationships and connections with market actors to facilitate responsiveness to the needs of poor consumers. The current market is also influenced by donor- funded activities, including programmes and donor-backed investments, that make unassisted market changes somewhat opaque. Therefore, ongoing monitoring of the sector and changes is important to better understand the sustainability of changes observed in this study.

There is currently much enthusiasm for the potential of PayGo model, but there are still challenges ahead. The model is expected to be profitable but the high

[181] Based on DSU key informant interviews

[182] A Lighting Global (2018) Study on the quality non-LG quality verified products found that products were more likely to pass on battery storage and physical durability, lumen maintenance, and physical ingress protection and PV power. They were more like to fail tests on battery protections, water agress protection, AC-DC charger safety, battery capacity.

levels of working capital required mean its viability is not yet fully tested in a difficult market like the DRC.[183] Only some businesses in DRC are able to secure the capital needed since funds are 'stuck with customers for up to 12 months'.[184] This challenge is not specific to DRC as solar businesses (including d.light, Greenlight Planet and Mkopa[185]) have needed to undertake several rounds of financing reaching into the hundreds of millions of dollars.[186] A few businesses outside of DRC, such as Mobisol, have also failed to meet the capital requirements.[187]

Covid-19 has also put pressure on PayGo operators and their customers.[188]

As banks are not currently providing consumer credit, consumers' access to finance currently rests with the success of the PayGo model, and risks to sustainability cited by interviewees included:

- High working capital requirements;
- DRC is an expensive country in which to operate;
- Increased credit risks, particularly with larger solar home system products;
- Currency devaluation and inflation risks when repayments are collected in local currency;[189]
- Risks of customers moving and avoiding payments; and
- Risks of customers finding ways to operate products after the company had turned them off.

Despite these challenges one business felt they would have a larger market share if they had been able to continue with PayGo, and another business noted they were looking to launch a PayGo offering before the end of 2021.[190]

The size of the market is still small and Élan supported a few manufacturers and many of the local importers and distributors. There are few other market actors (i.e non-Élan-supported) that have adopted new roles, developed new offers or products, or otherwise taken positive advantage of any opportunities created by Élan's interventions.[191] **Some market developments have been counter to the interests of poor people.** For example, a group of "informal resellers" has emerged to meet unmet demand for solar products in hard-to-reach locations. The informal resellers purchase products from distributors at retail prices, which they resell at higher than retail prices. While this circumstance demonstrates that demand is high, the inability of the formal market to meet this demand demonstrates the immaturity of the market. This is further reinforced by the emergence into the market of counterfeit "quality" products.

[183] DSU Key informant interviews.
[184] DSU key informant interview
[185] Mkopa operates in Kenya. Élan signed a partnership agreement with Mkopa to enter the DRC market but this did not materialise. Reasons for this are unclear.
[186] Among the most enthusiastic supporters of PayGo are those that are using it for all their sales transactions
[187] DSU key informant interviews
[188] See Cross, J and Neumark, T (2020).
[189] Not all businesses operate in local currency. Some accept foreign currency such as US dollar or Euro only and require customers to make payments into foreign bank accounts.
[190] DSU key informant interviews
[191] According to information gathered during DSU key informant interviews.

6.1.2 Resilience to shocks

The pico solar and ICS market is weathering the disruptions created by the COVID-19 pandemic, which are continuing at the time of this report (August 2021). Many interviewees commented that COVID-19 was contributing to reduced purchasing power of some consumers, leading to decreasing sales. Other factors, such as teachers not being paid, have also affected a key customer segment for renewable energy companies. Over the short to medium term, a reduction in investments into the renewable energy sector in DRC is expected due to decreases in donor funding and impact investing.[192] At the same time, other interviewees reported that their business had not been greatly affected by the pandemic and were positive about market opportunities over the long-term. Some businesses continued to also receive international investment during 2020/21 suggesting that the downturn in available funding may be short lived. It may be that the businesses are also seen as very investable.

[192] IFC (2021). Investing for Impact: The Global Impact Investing Market 2020.

7 Future programming

7.1 What are the implications for FCDO's future programming that may include the renewable energy sector in DRC?

Sub-questions

1. What are the key constraints that currently hinder poor consumers from increasing their access to off-grid renewable energy products? To what extent are these the same or different from constraints that existed 5 – 10 years ago?
2. What market changes would have the greatest effect on increasing many poor consumers' access to affordable energy in DRC in the short, medium and long term? To what extent, do these relate to policy, practices, resource allocation, relationships and mental models?
3. Which constraints are most feasible for a donor-funded initiative to address in the short, medium and longer term? How would they best be addressed?
4. There are several organisations or initiatives that aim to improve energy access to the poor in DRC. To what extent are they addressing the constraints identified? What are the gaps?

7.1.1 Changes in key market constraints

The overarching market challenge is that nearly 80% of the population in DRC lives below $1.90 per person per day and while there have been incremental improvements, poverty levels are unlikely to change soon.

Therefore, over FCDO's next programme period of five – ten years, much of the population will still only be able to afford lower quality pico solar. For this group, and some lower middle-income consumers (those below $3.20 pppd), affordability is the most pressing constraint on their mindset and decisions about energy access.

The market constraints that hinder poor consumers from increasing their access to off-grid renewable energy products remains the same as those identified by Élan in 2015 (See Section 2.1). These have not significantly changed, even though the number and quality of solar and ICS products on the DRC market has increased. Élan has demonstrated that there is effective demand from some low income consumers and then those in the top 15% of the income distribution (above $3.20 pppd). This consumer segment can be supplied profitably by commercial distributors and retailers. Since many in this segment already have access to energy (grid, generators), the benefit generated is access to reliable energy.

7.1.2 Market changes with the greatest effect on increasing access to affordable energy for poor consumers

There is not a compelling rationale for support from a development programme that serves the needs of upper-middle and higher-income consumers. These consumers can afford to purchase solar home systems at the current prices, and can more readily access credit, and these generate an attractive return for distributors and retailers. Rationales relating to clean energy and environmental impacts is also limited. Many in this group

already have access to the grid, so SHS are used as back-up rather than the main source of energy. These households do not make significant use of carbon-intensive alternatives.

The two market changes that could have the greatest effect on decentralised energy access for low-income consumers are: 1) removing import tariffs for renewable energy products; and 2) reducing charcoal use.

Removing high taxes: All solar products are imported and incur high import, and other taxes. This has already been identified by Élan but removing it has not materialised. If implemented, this could reduce the cost of all solar products by about one-third and quickly improve the cost-benefit equation by switching from candles and kerosene. It would immediately increase demand. The rationale for this intervention is mainly about improving the net incomes of low-income households. There would be an environmental gain from lower use of traditional sources of light, but this is secondary to the income effect. This intervention is also not about using savings from pico solar for income generating activities. [193]

Reducing charcoal use: The second way to improve the affordability of energy would be to reduce the 800kg of charcoal which each household uses for cooking annually in the DRC. This is a major expenditure for low-income households, is stimulating accelerating deforestation rates in DRC and contributes to ill-health in the household. The Élan programme has demonstrated that improved cookstoves can cut the use of charcoal by 30%. However, the uptake of ICS under Élan has been disappointing. Research is required to see whether the removal of tariffs will be sufficient to significantly increase adoption rates, or whether a different product would be more effective. For this intervention, the aim would be primarily to reduce deforestation but with important secondary income effects for low-income households.

There are also two opportunities beyond a focus on households. The Essor programme is currently piloting mini-grid solutions using a public-private partnership approach. The results of this will become clearer in the coming year. Additionally, a more centralised approach, DRC making effective use of its remarkable hydro resource endowment, is a sensible longer-term opportunity.

7.1.3 Feasibility for FCDO's support

In part the feasibility of support depends on FCDO's goals, time frames and risk appetite.

Outlined below are several activities that FCDO could support along with timeframes for support. Depending on when FCDO aims to commence a new programme, some proposed research and monitoring activities would ideally require support earlier than the typical timeframe expected for a large commercial tender. It may be that these could be completed as part of the business case, or be completed before or concurrently to inform directions.

We have not included subsidies, something that several business interviewees suggested as the quickest way to increase access to the energy for the poor. Other

[193] Rom, A et al (2017)

donors are providing subsidies in the solar and ICS sectors. If subsidies were considered in new programming, exit strategies developed ex-ante are critical.

Donors typically support business environment reforms and more work is to be done in this regard, although it is slow, arduous and uncertain. Rather than developing separate programmes, one programme focused on working with businesses and with government all under the same management would allow a programme to utilise a greater range of strategies to address constraints. This also helps to overcome issues related to different organisational incentives.

Taxes

Area of support	Timeframe
High taxes on renewable products	Short term: now – 2 years
Élan started the work to address the issue of high taxes but this is unfinished and the problem has also changed since individual exemptions now exist. Élan saw ACERD as the key instrument to achieve sector wide exemptions, but their capacity remains low. This is important because we have identified regulatory change (i.e. reducing the tariff) as a binding constraint. Further support for ACERD is only warranted if FCDO believe that it can realistically transform into a powerful lobby group in the next 24 months. There are several political economy issues to consider: the, at least perceived, power of international businesses in the membership (of which looking at governance arrangements may be worthwhile); the government's preference to negotiate on a business by business rather than businesses as a group. If following the change strategy with ACERD is not feasible, then providing energy policy reform advice in the Ministry to look at tariffs, but also mini-grids and electricity network functions would be beneficial, if it is not already being addressed by other donors. If FCDO supports the development of the market with greater income generating possibilities, then the scope of tax exemptions should cover these. Affordability remains a key constraint and addressing constraints such as high taxes can still contribute to reduced prices for consumers. There is a critical assumption that businesses pass on tax exemptions. Regular research (e.g. price surveys at six or 12 month intervals for the next two-three years) and the impact of tax exemptions on prices could be undertaken to understand how the benefits of tax exemptions are distributed.	

ACERD

Area of support	Timeframe
ACERD's capabilities	Short term: now – 2 years
Élan saw ACERD as the key instrument to achieve sector wide exemptions, but their capacity remains low. This is important because we have identified regulatory	

change (i.e. reducing the tariff on imported green technology) as a binding constraint. Further support for ACERD is only warranted if FCDO believe that it can realistically transform into a powerful lobby group in the next 24 months.

Several interviewees felt ACERD's work benefited select members. It could be valuable to review ways to increase trust across the membership. This could include a membership feedback survey, reviewing governance structures and processes including leadership roles and length of appointments, that consider how different members can participate (e.g. sometimes leadership roles fall to large businesses with greater capacity).

Power Africa noted they were also supporting ACERD's advocacy, although the details are unclear.

Energy agencies

Area of support	Timeframe
ANSER, ARE, UCM capacity	Short – medium term

The Government of DRC has recently announced key appointments for ANSER and ARE. As new agencies they will likely need notable levels of support to help deliver on their mandates. Élan[194] also noted that further strengthening of the legal and regulatory framework is needed. ARE and ANSER are critical to a coherent and concise off grid energy policy.

Support needs to be mindful of the foreseen relationship and mandate uncertainties between UCM and ARE.

Products that provide more income generating potential

Area of support	Timeframe
Development of market for solar products that contribute more to income generating activities	Medium term 3 – 5 years

More consideration could be given to productive use leveraging solar energy or PULSE products (that include solar water pumps, cold storage for agricultural applications as well as refrigeration and appliances for microenterprises) rather than pico solar and SHS. This may include products for certain sectors, such as agriculture.

The market for these products is very nascent and again the affordability of products is a key constraint, so efforts in this area also need to consider price and consumer finance. Outside of the DRC, the market for solar water pumps has seen little commercial development with government subsidies driving sales.[195] Consumer awareness is also critical. Synthesising lessons from other programmes in African would be useful.[196]

[194] Élan 1.2 (2021). Project Completion Report
[195] GOGLA (2020). Off grid solar market trends report.
[196] See here for example

An additional critical issue for consideration is the role of women in the sector, either as entrepreneurs, employees or customers and how support can ensure that women equally benefit from technology design, development and use.

FCDO is already supporting the development of technology in this market - see the Low Energy Inclusive Appliances (LEIA) Programme. FCDO could leverage Élan's experience, knowledge and connections in the agricultural sectors.

Products that are not quality verified to Lighting Global / International Energy Agency standards

Area of support	Timeframe
Low quality vs quality verified products	Short term

Élan has demonstrated that some poor households will switch to lanterns and these will have some net income benefits. This is even though the main constraint to high prices (high import tariffs) has not changed and the focus on quality verified products does not address the affordability constraints for low-income households. However, the rate of sales growth to low-income households has been slow and some of Élan's partners are not finding this market segment sufficiently profitable to be attractive. The conditions for scale-up are not yet present. The tariff reduction may help stimulate greater effective demand for quality lanterns.

In addition, FCDO should investigate whether promoting quality-verified products is the most effective strategy to get reliable units into poor households. This would require an objective assessment of the market (including looking at 'Chinese' products, that are certified to standards other than Lighting Global/International Energy Agency, and others) and examine the most appropriate scalable products for the DRC market and negotiating decent rates for these from manufacturers – and then passing this information onto the distributor / retailer network. The ongoing building of consumer awareness is critical.

In light of earlier suggestions this assessment could look at the pico solar products as well as products that may support more income generating opportunities.

Market monitoring

Area of support	Timeframe
Pico solar and SHS market systems change monitoring	Short term

The market is still in early stages of development, but it appears there is a shift in some areas that Élan supported away from inclusiveness towards the more lucrative solar home systems that are affordable to the top 15% of the population, not the bottom 85%. However, monitoring the market changes and seeking to better understand some aspects that we were not able to fully explore could be useful as FCDO develops its next phase of support. This includes:

- Businesses' focus on serving poor customers' needs, not only meeting those in other income groups that do not have access to reliable energy.
- Product price changes and changes in credit terms following reduced taxes on renewable energy products;
- Assessment of interest rates in the credit offered by renewable energy businesses, and levels of indebtedness among poor customers.

Deforestation

Area of support	Timeframe
Research on ICS or alternative adoption rates	Medium – long term

Research is required to see whether the removal of tariffs will be sufficient to significantly increase adoption rates of improved cookstoves, or whether a different product would be more effective. For this intervention, the aim would be primarily to reduce deforestation but with important secondary income effects for low-income households.

USAID conducted research in 2018 on private sector opportunities to mitigate deforestation, which may be a useful reference. It can be found here.

7.1.4 Gaps in support to the sector

This study aimed to identify current donor support to pico solar and ICS markets. However, information gathered is very incomplete as interviewees spoke about initiatives in very general terms and did not provide specifics such as the businesses and organisations they partnered with and the nature of those partnerships.[197] It was therefore not possible to determine gaps in support.

Ongoing monitoring and further consultations by FCDO, therefore, remain important.

Based on our review, the World Bank and USAID appear to be the biggest contributors in the sector in DRC but there are many actors including non-government organisations, particularly in the ICS sector. The two World Bank programmes listed in Table 13 are due to end in 2022. Box 3 in Section 4.1.3 provides some insights into the multi-layered and overlapping levels of programming and intervention, including FCDO funding.

Some key donor funded initiatives include:

Table 12: Key donor funded initiatives related to Élan's areas of work

Initiative	Funder	Activities relevant to Élan's MSC

[197] We spoke with Power Africa (USAID funded), UNCDF and GiZ, the latter specifically to follow up their earlier support to consumer protection. We also sought interviews from SNV but they concluded their support to the sector some years ago and technical staff were no longer in DRC. Also see Section 1.2.2 Limitations.

Unknown	GIZ	Workshop held in early 2020 on PayGo model, with a second planned for August 2021. This support does not appear to be part of a larger programme of support. GiZ earlier supported the Government around consumer protection, but this was not successful.
Power Africa	USAID	Power Africa is supporting several SHS companies that are now moving into the DRC market, especially in the eastern DRC (North and South Kivu). Support to ACERD Operating since 2013, Power Africa works in several countries in Africa; implementation end date unknown
Invest Activity	USAID	The activity educates businesses about the investment process and supports their investment readiness by assisting with document preparation and ensuring satisfaction of investor conditions. By cultivating a pipeline of high-potential agriculture, energy, and mining businesses poised for growth, USAID's Invest Activity aims to mobilize $100 million in private capital in eastern DRC. 2021 - 2026
EASE Project	World Bank	Several off-grid solar companies have been provided with subsidies to install more affordable solar home systems in selected off-grid areas[198] 2017 - 2022
Improved Forested Landscape Management Project	World Bank	Support to ICS manufacture and distribution 2014 - 2022
Clean start programme	UNCDF / UNDP	ICS Implemented across multiple countries; implementation period unknown

[198] World Bank (2021). Implementation Status & Results Report