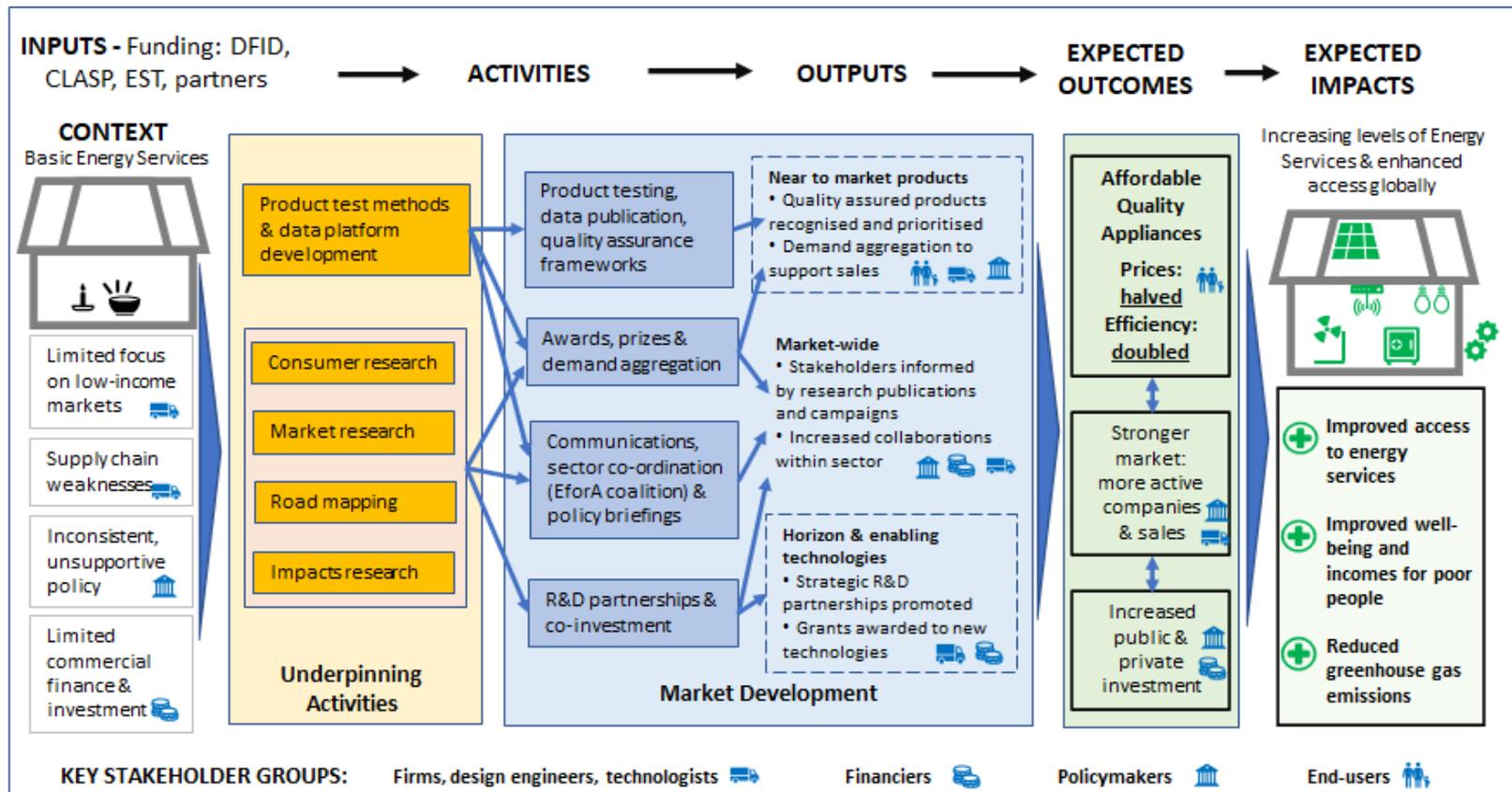




**LEIA Contribution Case Study:
Pakistan weak- and off-grid fan market**

Low Energy Inclusive Appliances (LEIA)

- UK aid and IKEA Foundation funded research and innovation programme that seeks to improve the efficiency and affordability of a range of electrical appliances suited for off- and weak-grid contexts.
- The programme's theory of change (ToC) is that increasing the availability, affordability, efficiency and performance of off-grid and weak-grid appliances will lead to improved clean energy access, wellbeing and incomes of people in developing countries and reduced greenhouse gas emissions.



LEIA contribution case studies

➤ Purpose:

- To link LEIA activities and outputs to the observed outcomes and impacts
- To demonstrate contribution and validate LEIA's ToC

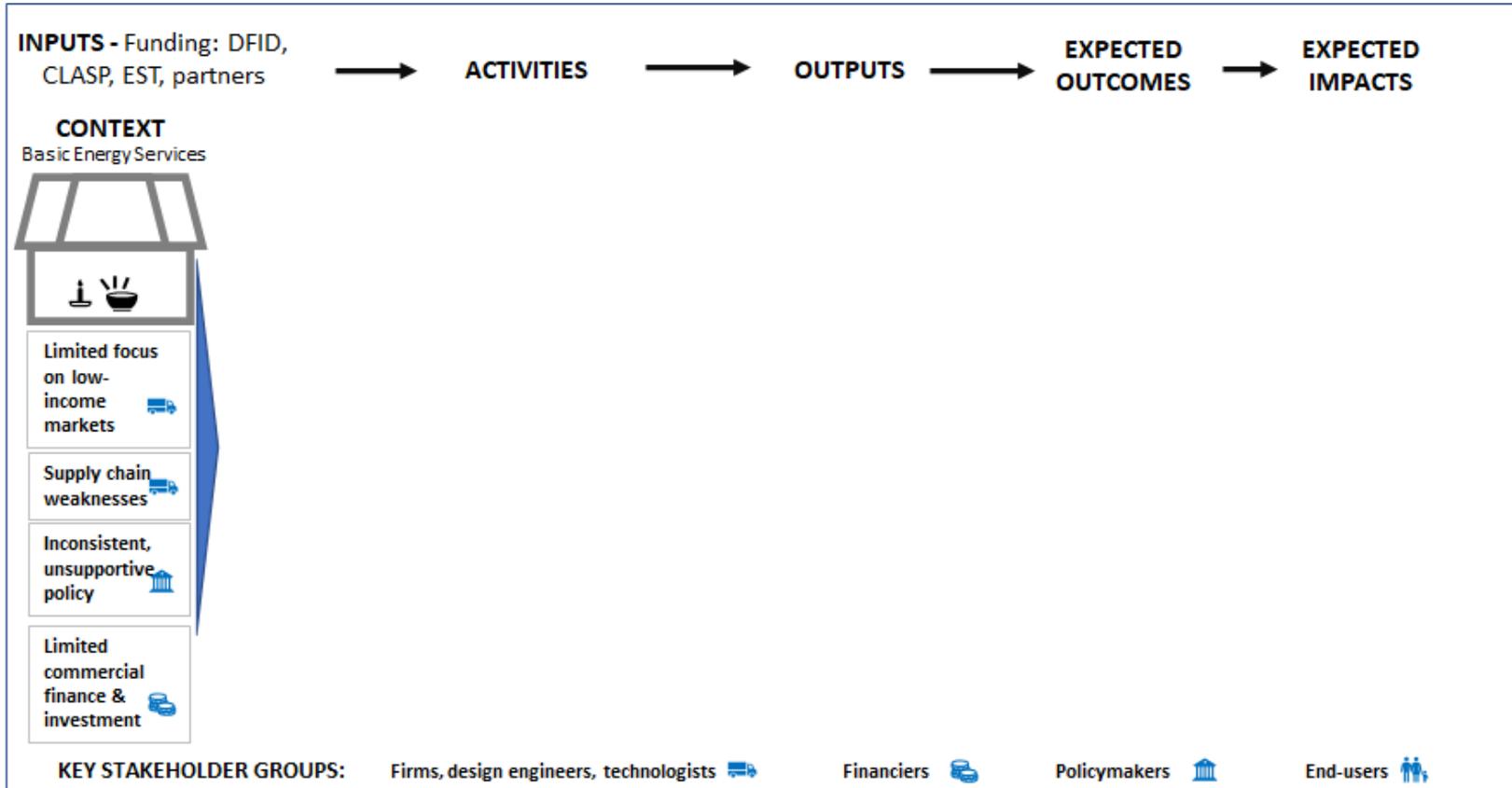
➤ Method:

- Build on emerging programme evidence with additional mixed methods research: literature review, quantitative analysis and semi-structured interviews with a purposive sample of relevant stakeholders
- This presentation provides a case study that examines the combined influence of LEIA interventions on **Pakistan's off-grid fan market.**

Context

- In Pakistan, due to the regular hot and humid weather conditions, cooling has become the main driver for solar home systems (SHSs).
- Local consumers prefer metal body fans with high air flow.
- Locally manufactured fans deliver high airflow but consume a lot of energy and cannot be supported by small SHSs. Imported fans do not deliver sufficient airflow to meet local cooling need (**supply chain weakness**).
- Local manufacturers were reluctant to invest in improving their fans. Small and medium enterprises have **limited commercial finance & investment**; big brand fan companies tend not to focus on DC fans (**limited focus on low-income markets**).
- The DC fan market is largely unregulated and quality standard is non-existent (**inconsistent and unsupportive policy**).

LEIA context



LEIA activities

➤ Product testing

- In 2018, collaborated with IFC to undertake a market scoping survey, which involved picking a sample of ten fans from the market for lab testing.
- The pedestal fans tested consumed 16 – 68% more than the average energy consumed by other fans tested under LEIA.
- Powering a single fan for 12 hours in Pakistan would require a 300 Watt-peak PV panel and 130 Ah lead-acid battery.

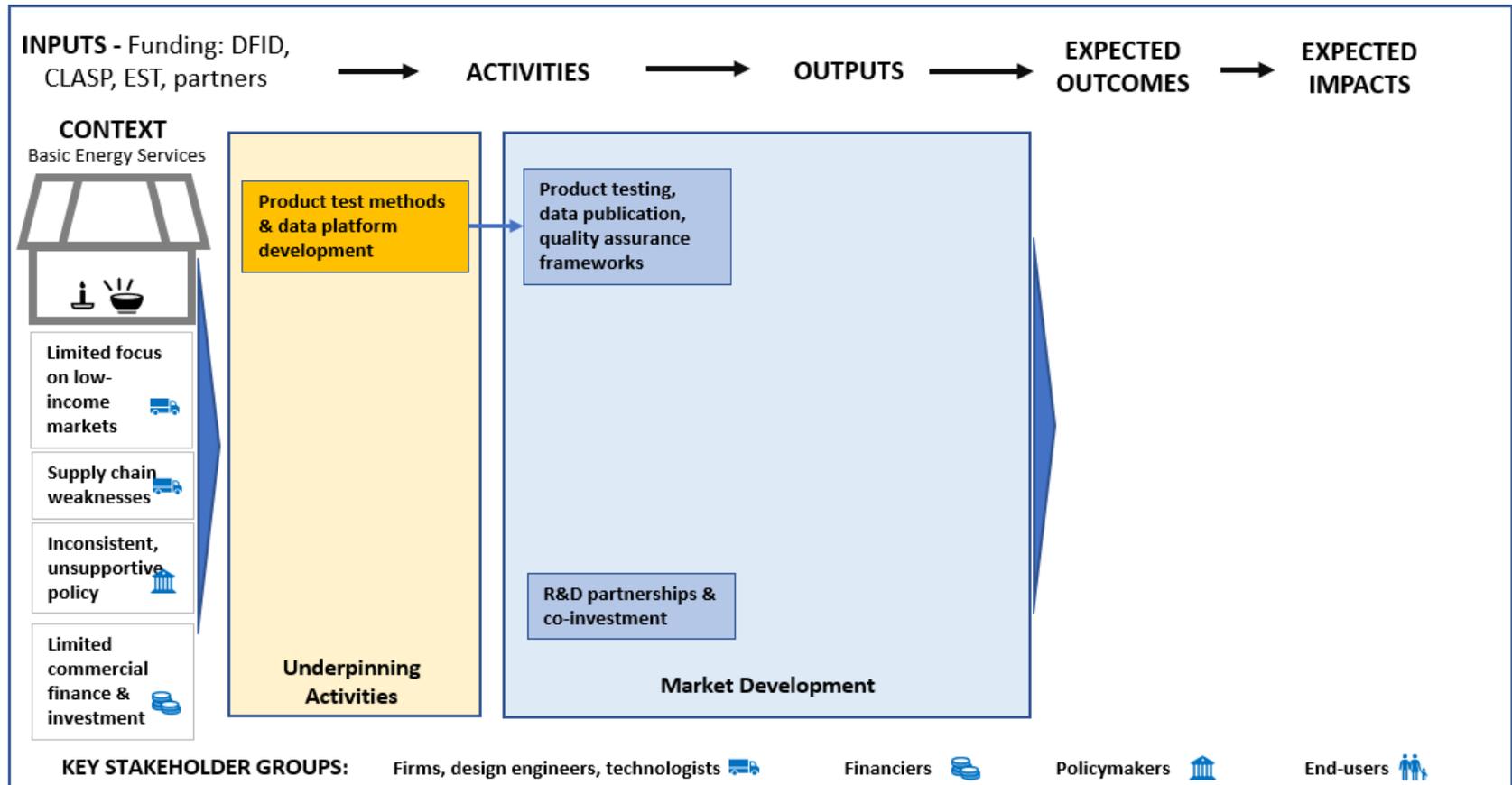
➤ Local capacity building

- Supported a local test lab, Pakistan Council of Scientific & Industrial Research (PCSIR) to adapt and use VeraSol test method for DC fans testing.

➤ R&D funding

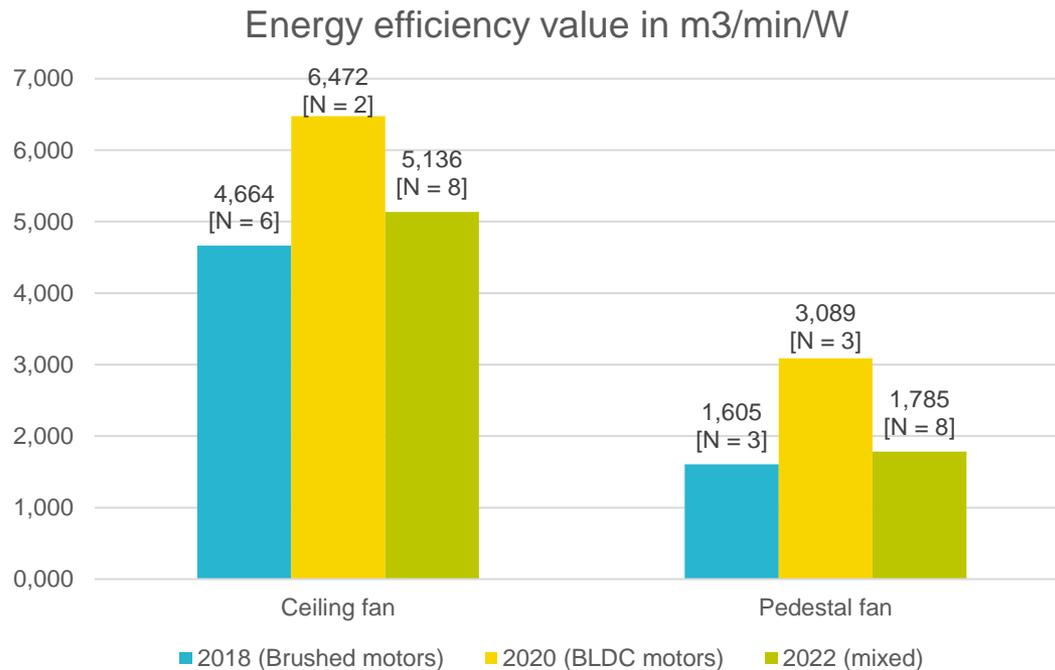
- Supporting a local SHS company, Harness Energy to develop a super-efficient BLDC fan with rechargeable feature.

LEIA activities



Outcome: Improved efficiency

- Market scoping survey has enabled the World Bank to effectively identify and engage with local fan manufacturers
- Test results encouraged local fan manufacturers to improve the efficiency of their fans, including adopting BLDC motors.

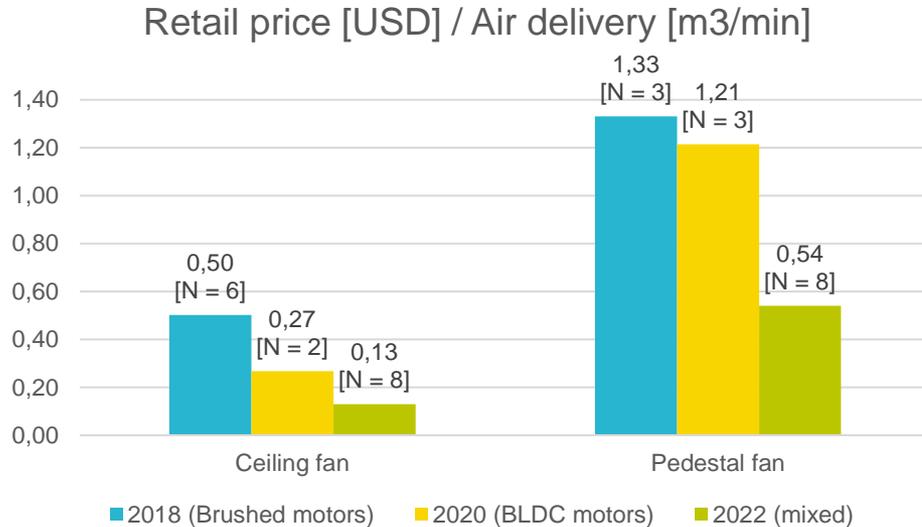


Harness Energy pedestal fan prototype, developed with the support of EforA R&D fund achieves an energy efficiency value of **3.17 m³/min/W**

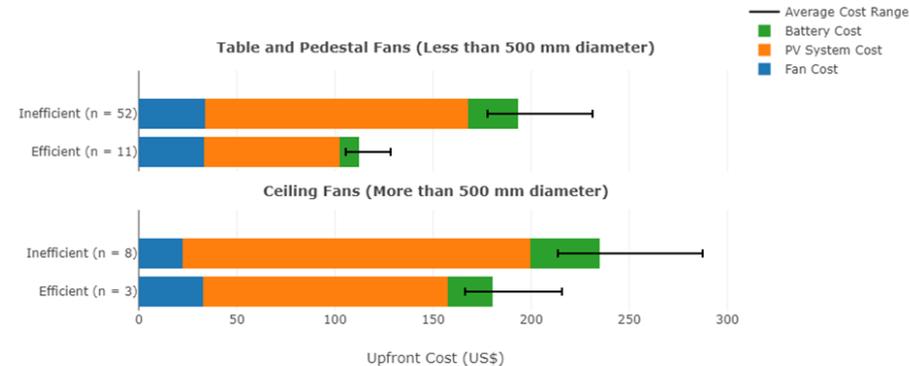
A comparison of Pakistan manufactured fans tested under the LEIA programme in 2018, 2020 and 2022

Outcome: Improved affordability

- Improved fan efficiency increases fan cost but a comparison of Pakistan fans tested in 2018 and 2020 shows the average cost per service delivery has reduced.



A comparison of Pakistan manufactured fans tested under the LEIA programme in 2018, 2020 and 2022



Source: Efficiency for Access (2021) Appliance Data Trends (sample is not restricted to Pakistan)

- The increase in fan cost is also offset by the SHS cost as a smaller system is required to power the fan.
- BLDC motors are more durable than the conventional brushed motors, therefore reducing the need for replacement and resulting in overall lower lifetime cost.

Other outcomes

➤ Increased durability

- Fan manufacturers are able to offer 1 to 2-year warranty
- E-waste reduction – imported plastic fans do not have warranty so when they break down, it becomes a disposal item

➤ Adoption of quality standard

- The World Bank's \$105 million energy access programme in Pakistan – Sindh Solar Energy Project has adopted the performance standard developed by LEIA for screening fans

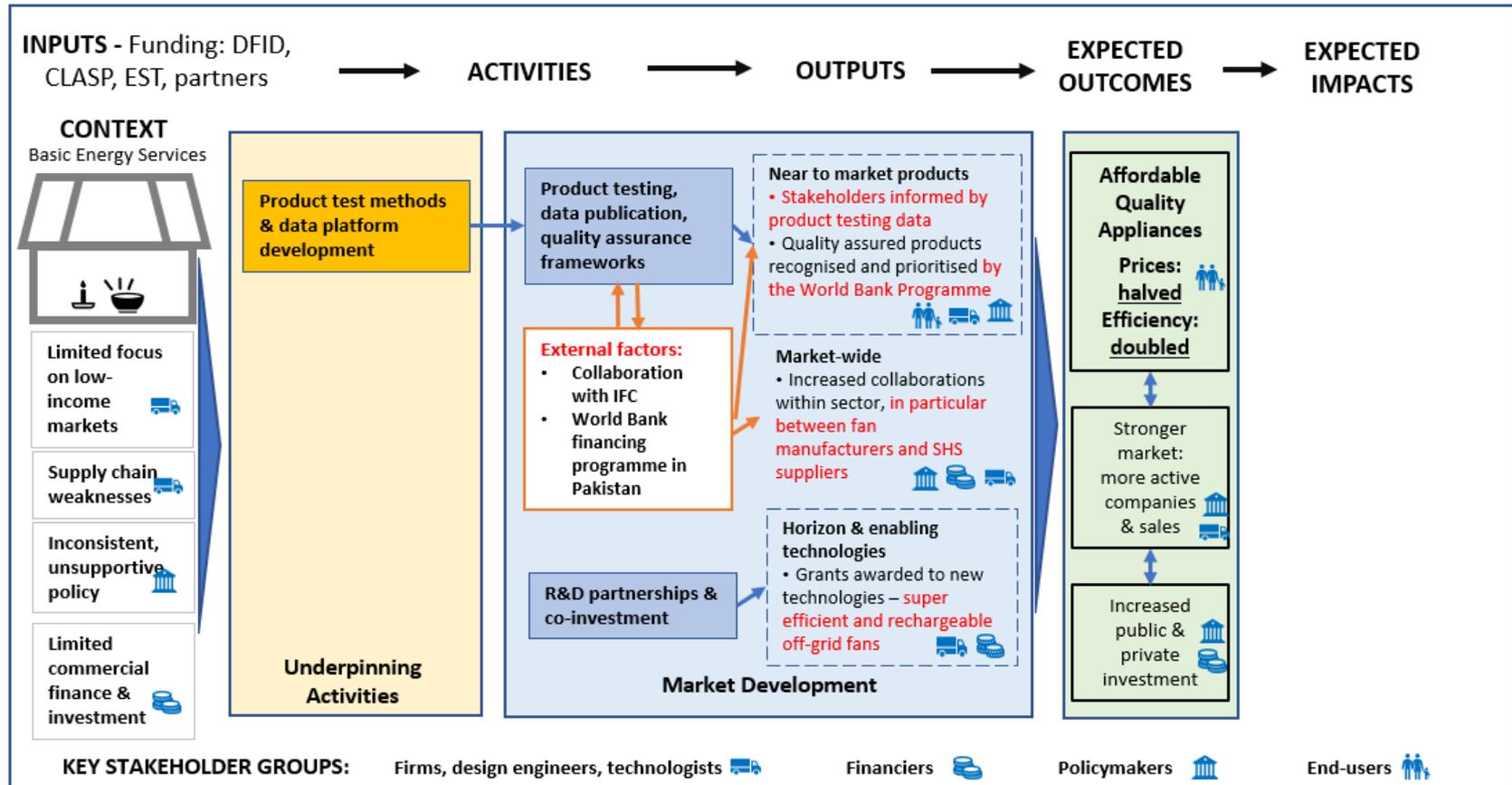
➤ Local lab capacity building

- Local lab, PCSIR now provides testing for DC fans

➤ Increased public and private investment

- Local fan manufacturers invested in improving their fans.
- Harness Energy's matched funding for their EforA R&D project
- NEECA provided funding to local fan manufacturers for fan testing.

LEIA outcomes



Impacts

➤ Fans sales

- Fans are the most popular off-grid appliance in Pakistan due to the hot and humid climate. [GOGLA's Global Off-Grid Solar Market Report](#) (H1 and H2 2021) reported 350,000 off-grid fan sales in 2021, most of them were in Pakistan.
- Further fan sales will be facilitated through country level programmes, such as World Bank's Sindh Solar Energy Project and the [PMIC-KfW's PRIME](#)
- Timely development of highly efficient fans and performance standards ensure large-scale deployment of fans are good quality and meet local cooling need.

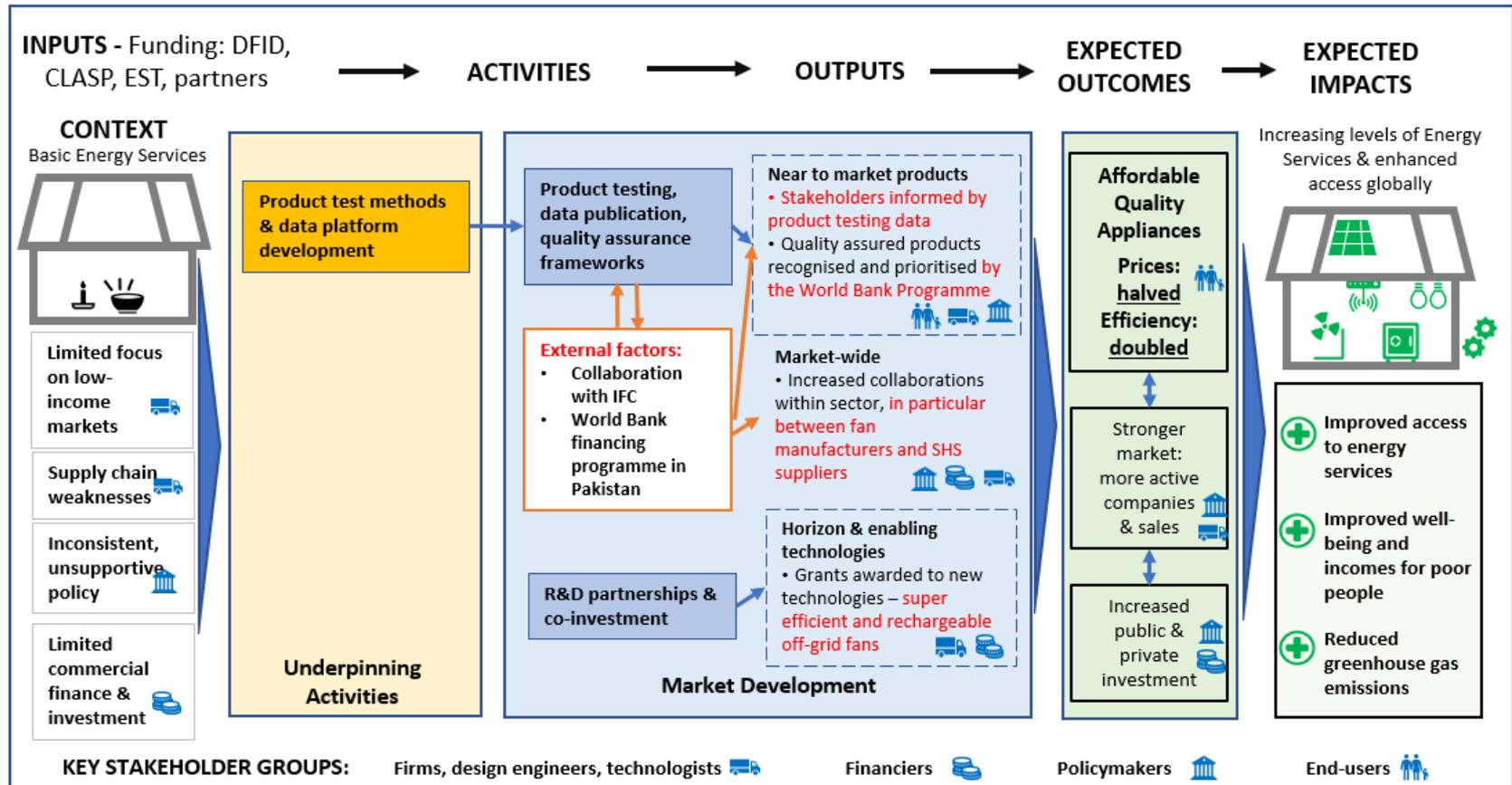
➤ Benefits to end users

- [The Socio-Economic Impact of Super-Efficient Off-Grid Fans in Bangladesh](#)
 - Health and productivity benefits
 - Increased energy access for households that purchase the fan with a PV system.
 - Increased business productivity

➤ Climate mitigation and adaptation

- Highly efficient fans that can be powered by small SHSs displace diesel generators and avoid greenhouse gas emissions
- Access to fans help build climate resilience

LEIA impacts



Conclusions

- Product testing in Pakistan facilitated the World Bank and local fan manufacturers' decisions and actions to improve the quality and performance of locally manufactured DC fans.
- EforA R&D funding enabled a local SHS company, Harness Energy, to develop a highly efficient and durable off-grid fan that meets the needs identified by their customers (sufficient air flow and prolonged cooling time). Collaboration between Harness Energy and local fan manufacturers also facilitated knowledge transfer and strengthened supply chains.
- This case study demonstrates that LEIA's interventions have led to a stronger Pakistan off-grid fan market and more affordable, better-quality fans that meet the local cooling demand. This, in turn, will contribute to the success of other in-country energy programmes that will accelerate local market growth and enable more people to access fan-based SHSs
- Key learning:
 - Strategic partnership and collaboration with another programme implementer can amplify the impact of LEIA work.
 - Further support is required to help the local government to adopt quality standard in order to sustain the impact of LEIA work.