CONFERENCE PROCEEDINGS

Enabling a Just Transition for MSMEs and Workers in the Indian Automotive Industry

SKILLING, TECHNOLOGY, AND FINANCE NEEDS FOR A JUST AND INCLUSIVE TRANSITION FROM INTERNAL COMBUSTION ENGINE VEHICLES (ICEV) TO ELECTRIC VEHICLES (EV) MANUFACTURING

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BACKGROUND

On August 12, 2022, WRI India launched the Coimbatore MSME ICEV-EV Transition Initiative (MITI) at the Elektrotec Exhibition conducted by the Coimbatore District Small Industries Association (CODISSIA) in Coimbatore, Tamil Nadu. To roll out the initiative, on August 25, WRI India signed a memorandum of understanding (MoU) with Facilitating MSMEs of Tamil Nadu (FaMe TN, previously M-TIPB) in the presence of the Chief Minister at the Regional MSME Meet organized by the Micro, Small, and Medium Enterprise (MSME) Department of Tamil Nadu. This initiative aims to pilot a clean and just internal combustion engine vehicle–electric vehicle (ICEV-EV) transition among MSMEs in Coimbatore in collaboration with key local stakeholders. These conference proceedings summarize insights from two discussions conducted during the launch event, as well as a series of stakeholder consultations conducted thereafter with experts from the government, industry, MSME associations, financial institutions, and other automotive and EV experts. Through these consultations, we have discussed and mapped the implications of the technology change from ICEVs to EVs for automotive-component-manufacturing MSMEs in terms of their needs, challenges, and opportunities regarding technology, finance, policies, and skilling to help them equip themselves and their workers in the transition.

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INTRODUCTION

The need to rapidly decarbonize our economies and prevent the worst impacts of climate change is becoming increasingly urgent, as average global temperatures were 1.1°C above the pre-industrial baseline as of 2021 (IPCC 2021). This means deriving our energy from clean and renewable sources instead of fossil fuels; using new green and sustainable methods, processes, and technologies for industrial production instead of conventional ones; and reducing our demand wherever possible through material, resource, and energy efficiency. In India, this transition may lead to many positive outcomes such as innovation, new business opportunities, higher investment flows, lower energy and operation costs, and the opportunity to become market leaders in new emerging industries such as EVs and green hydrogen, all of which would contribute to India's socioeconomic and job growth. However, the transition to new clean industries will impact existing actors of conventional energy industries, from coal miners to manufacturers of fossil-fuel-based technologies. In the case of the transport sector, to align India's growing demand for transport with low-carbon pathways, there is a need to shift from ICEVs, which run on oil or gas, to EVs, which run on electricity. To ensure that the transition from ICEVs to EVs does not adversely affect current stakeholders in the ICEV value chain, especially those who are already vulnerable, such as MSMEs and their workers, there is a need to ensure that the transition is planned in a manner that is just, inclusive, and socially equitable.

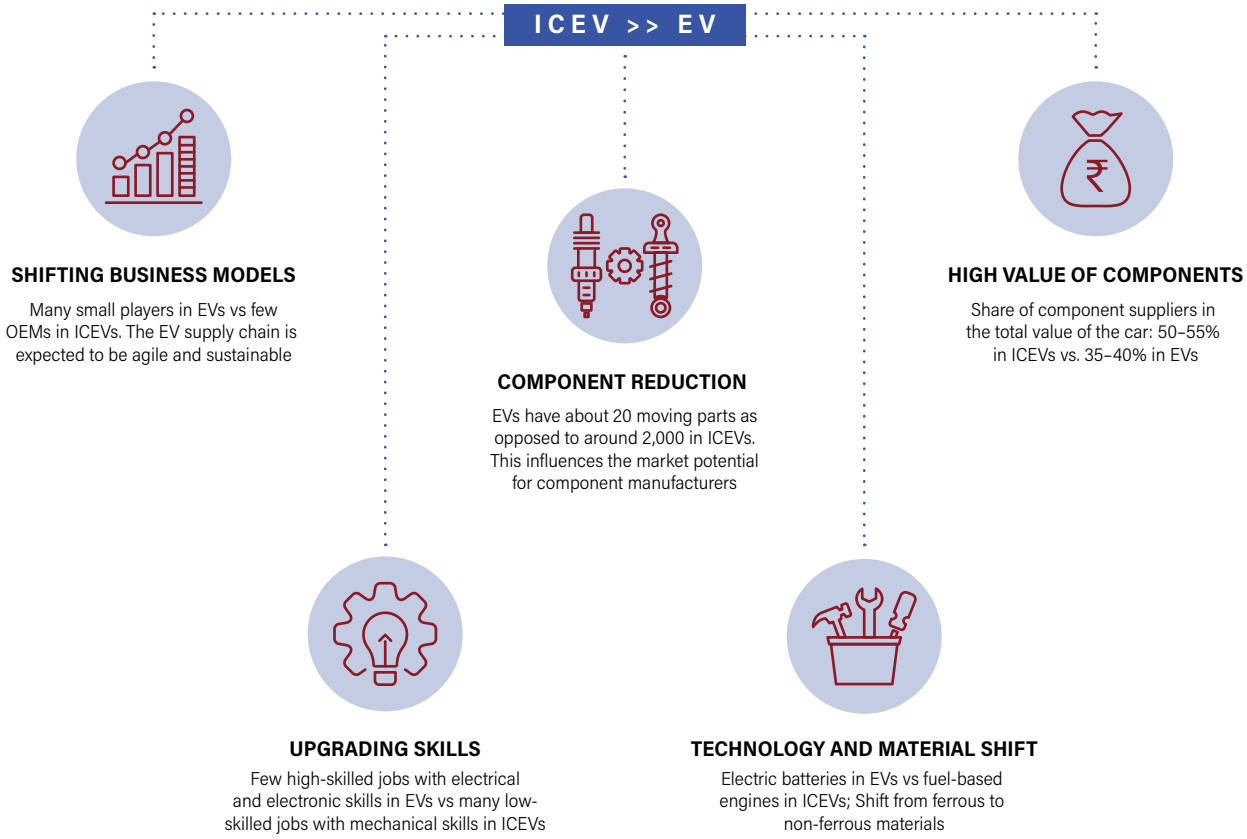
NEED FOR A JUST TRANSITION AMONG MSMEs IN THE AUTOMOTIVE INDUSTRY

Dependence on expensive oil imports, aggravating air pollution, growing international and national climate ambition, and the business case for manufacturing EV batteries (Saran 2021) has led to massive ambition and interest on the part of the public and private sectors in developing India as an EV manufacturing hub, supported by a slew of government incentives and private sector investments in R&D and product development. As a result, over the last few years, the growth rate of EVs has far outpaced that of ICEVs, with EVs growing rapidly in 2019 even when the ICEV industry experienced degrowth, taking the share of EVs in India's vehicle fleet from less than 1 percent in 2019 to 4.7 percent in 2022. Although most large automotive OEMs have started diversifying to EVs, there are 35,000 to 45,000 MSMEs employing 15 million people who manufacture the over 2,000 components that make up an ICEV (KPMG 2013). However, the EV industry differs significantly from the ICEV industry in that it requires fewer but higher-value components and different technologies, materials, processes, business models, and skills (see Figure 1). As a result, the business outlook of these MSMEs may be at risk as the automotive industry transitions from ICEVs to EVs.

These MSMEs—predominantly micro, many of which are informal—often work in financially precarious conditions, with low access to formal sources of capital/credit and limited capacity to plan their business beyond short-term deliverables. This reduces their ability to invest in new technologies or in upskilling/reskilling their workers and thus adapt to external transitions/impacts. Moreover, many of the workers employed in MSMEs are migrants in informal or non-contractual arrangements. They are thus not covered under social security schemes, have nontransferable skills, and are the first to lose their jobs in the case of a business downturn.

Thus, to ensure that India's low-carbon transition also aligns with its socioeconomic development and growth goals, it is crucial to ensure that vulnerable MSMEs and their workers benefit rather than suffer from the EV transition. To achieve this, they must be supported in understanding how the EV transition will impact their businesses, identifying new alternative opportunities in the EV or allied sectors, making the requisite technology transfer, securing the finance to do so, and reskilling their employees. If done in a systemic, planned, and timely manner, these interventions can not only help preserve the MSMEs and the livelihoods they support, but also improve their competitiveness, financial resilience, and the number of people they employ, by helping them access new business opportunities, creating new targeted jobs for

FIGURE 1 | Technology change from ICEV to EV



Notes: EV = electric vehicle; ICEV = internal combustion engine vehicle.

Source: Authors

women, and increasing the level and quality of their workers' skills. WRI India's engagement with industry stakeholders under this initiative is aimed at informing interventions and policies toward enabling a just and equitable ICEV-EV transition for automotive-component-manufacturing MSMEs and their workers.

MAPPING THE ICEV-EV TRANSITION

Three major shifts in the ICEV-EV transition are summarized in Table 1

1. The ICEV engine will be replaced by an electric motor

Electric motors convert electric energy to kinetic energy (that is, torque to make the vehicle move), making them the most important part of the EV powertrain. They will replace the ICEV engine, making the engine components of ICEVs, such as the piston, crankshaft, flywheel, and spark plug, obsolete in the transition. MSMEs that manufacture these components are thus at "high risk" and will require the most transition support, such as mapping alternative opportunities either in the EV or other sectors based on their skills, providing market access, and conducting training programs for workers. On the other hand, pump and motor MSMEs, which primarily supply to the agriculture industry, are among the industry players who are best placed to manufacture EV motors, and will require handholding to enter the automotive industry, not just in terms of technology, finance, and skills, but also in developing their capacity to adopt the quality standards and comply with the standards required for the automotive industry.

TABLE 1 | Risk mapping of the technology change from ICEVs to EVs

ICEV COMPONENT CATEGORY	EV COMPONENT CATEGORY FOR SAME FUNCTIONALITY	RISK LEVEL FOR ICEV MSMEs	TRANSITION NEEDS
Engine	Electric motor	High	▪ Help MSMEs that manufacture engine components diversify toward non-automotive sectors ▪ Help MSMEs from other sectors that can potentially enter the automotive sector, such as agricultural pump and motor manufacturers, explore new opportunities in EVs
Fuel delivery and exhaust systems	Battery, controller and battery management system	High	▪ Help MSMEs that manufacture components of fuel delivery and exhaust systems diversify toward non-automotive sectors ▪ Help MSMEs from other sectors that can potentially enter the automotive sector, such as electrical and electronic component manufacturers, explore new opportunities in EVs
Cast metal components of transmission and other systems – ferrous castings	Aluminum castings	Medium	▪ Help ferrous casting MSMEs enter the non-ferrous sector by equipping them with knowledge of die-casting technology, manufacturing processes, purchase of equipment, and upskilling of workers

Notes: EV = electric vehicle; ICEV = internal combustion engine vehicle; MSME = micro, small, and medium enterprise.

Source: Authors.

2. The ICEV fuel delivery and exhaust systems will be replaced by a battery, controller, and battery management system

The IC engine is driven by fossil fuel, which is fed into the engine from the fuel tank by a fuel delivery system. An ICEV also has an exhaust system to discharge the burnt gases from the engine after generation of power. The electric motor in an EV will be driven by electricity generated by controllers that convert the energy stored in the battery, whose optimum thermal conditions are ensured by a battery management system (BMS). Thus, a transition from ICEV to EV may result in the replacement of cast metal mechanical components of fuel delivery and exhaust systems by electrical and electronic components such as the battery, motor controller, and BMS. Manufacturers of components that could be replaced will require transition support, such as mapping alternative opportunities either in the EV or in other sectors. In the EV sector, they can be helped to upskill themselves and manufacture components of other systems, such as the transmission, with their existing capabilities.

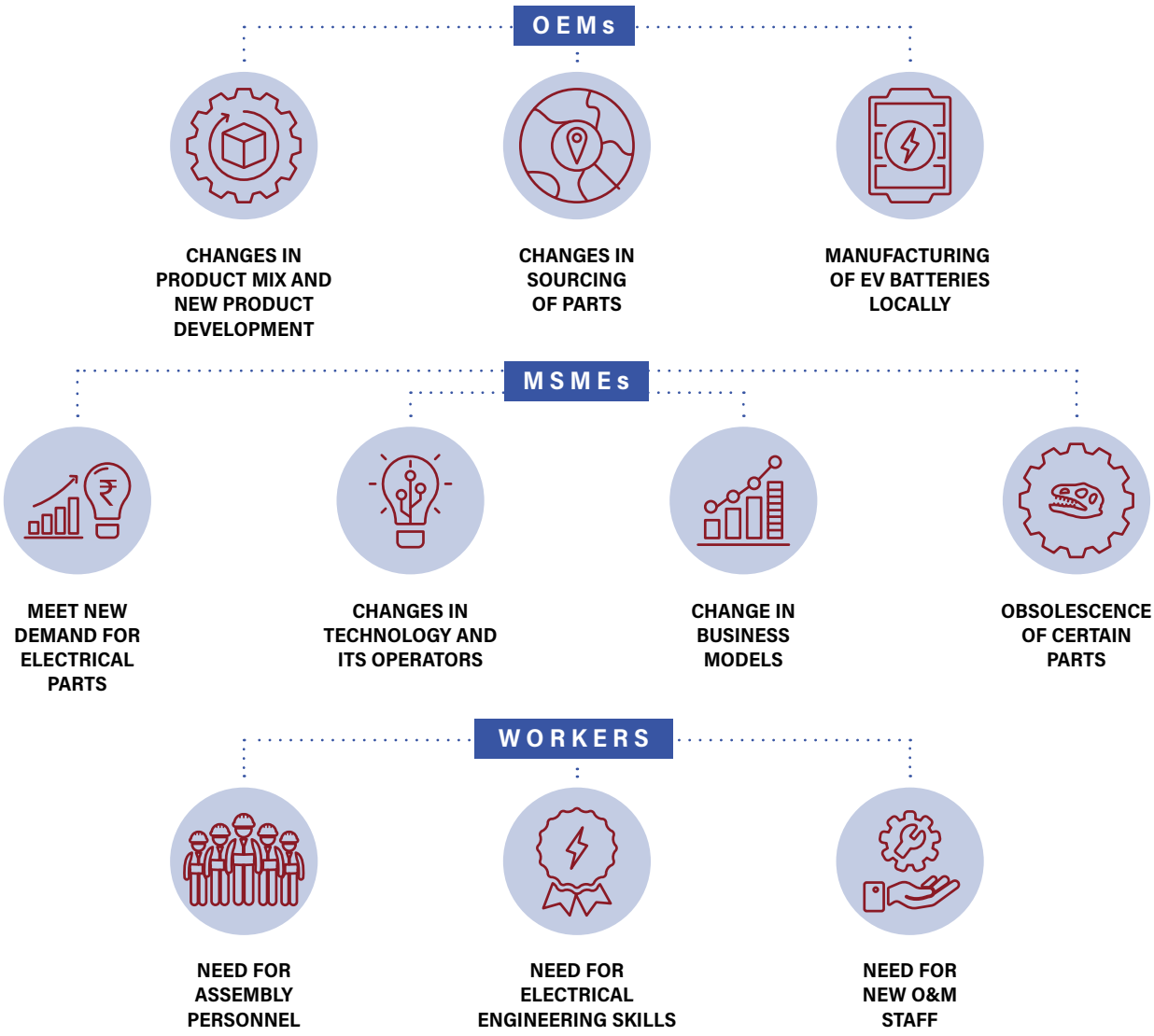
3. Ferrous castings will be replaced by lighter and fewer aluminum castings

Although most cast metal components of the transmission and other systems of an ICEV will continue to be part of EVs, a fundamental shift could occur in the material, number, and size of the components. The choice of aluminum stems from its higher strength-to-weight ratio, given the need for lightweighting in EVs to improve their energy efficiency (aluminum reduces the weight of the vehicle by 40 percent); better quality; and structural integrity. Whereas ICEV engines consist of approximately 200 aluminum castings (which will become obsolete), EVs will consist of ~25 percent more aluminum by weight, but the number of components will decrease by a factor of 10, impacting the revenue of existing ferrous casting MSMEs. Further, castings

will become bigger because EV manufacturers prefer to integrate modules, called gigacastings, so MSMEs might need to learn the process of making such bigger castings and adapt the technology and infrastructure accordingly. The casting industry will need to rise to the challenges posed by EVs, such as using lightweight aluminum and other alloys, adopting simulation to improve precision, issuing joint standards for specifications, and conducting quality inspections to ensure comparable production processes and results. The electric drive technology will also require highly complex aluminum components to complete fully integrated EV modules, internal transmission parts, housing structures for power electronics, electric motor housings, energy recovery components, and fuel cell stacks, all of which will offer opportunities to foundries (MfgTechUpdate 2021).

Other major component categories such as the body, chassis, suspension, braking, and lights will need only minimal changes in the ICEV to EV transition, and therefore the risk is low for MSMEs manufacturing such components. Although there may not be a major shift in the technology and manufacturing processes for these components, they could become more advanced and complex, requiring MSMEs to upgrade their knowledge and skills accordingly. The impact of these transitions on key stakeholders is summarized in Figure 2.

FIGURE 2 | Impacts of ICEV-EV transition on stakeholders



Notes: EV = electric vehicle; MSMEs = micro, small, and medium enterprises; OEM = original equipment manufacturer.

Source: Authors.

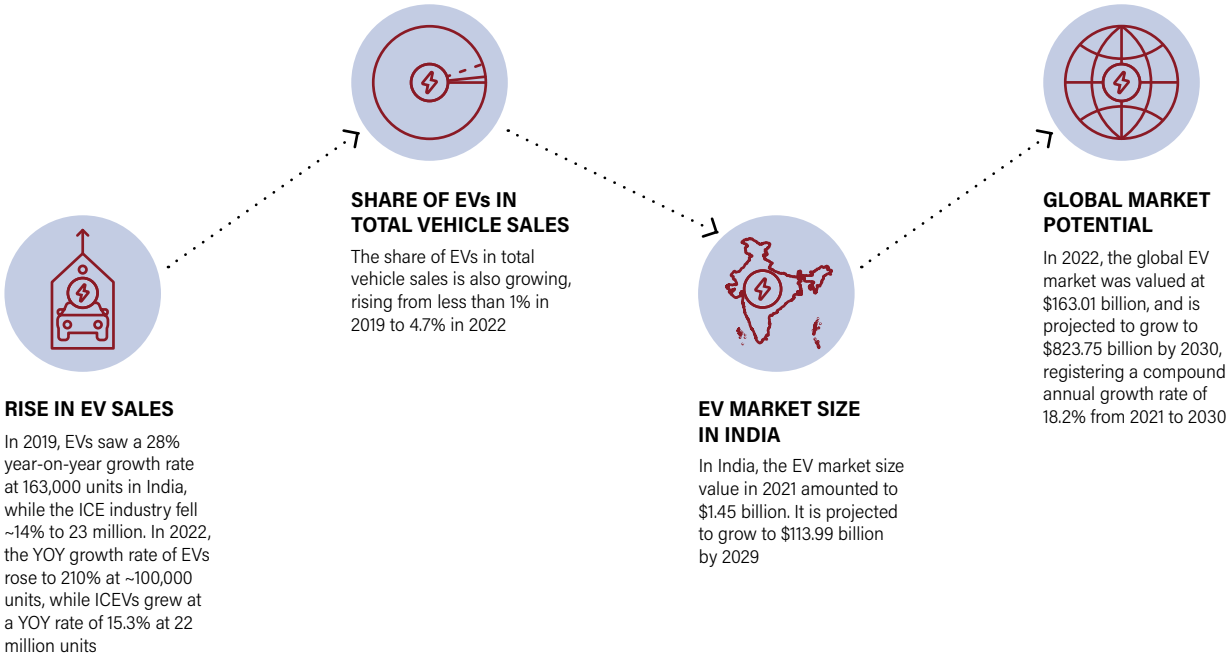
LESSONS FOR ENABLING A JUST TRANSITION AMONG ICEV MSMEs

To help ensure that ICEV MSMEs are supported in the transition to EVs, this section highlights the needs, challenges, and opportunities for ICEV MSMEs, and the awareness, technology, finance, skilling, and policy support they need to manage the transition successfully. This section is based on discussions with stakeholders.

1. Building awareness among MSMEs

Figure 3 shows the historical and future outlooks for the EV and ICEV industries.

FIGURE 3 | Growth trends in the automotive industry



Note: EV = electric vehicle; ICEV = internal combustion engine vehicle; MSME = micro, small, and medium enterprise; YOY = year on year

Source: Authors.

- It is evident that the gap between EVs and ICEVs is reducing, especially in the two-wheeler (2W) and three-wheeler (3W) segments in the short term. Although consumers, governments, and large companies are aware of this transition, automotive-component-manufacturing MSMEs are not, including the impact it will have on their businesses. The MSMEs that intend to enter the EV supply chain come from both the ICEV supply chain and other sectors such as agriculture equipment and consumer electronics, and they lack sufficient knowledge and understanding of the rapidly changing technology and policy scenario of e-mobility in India. Indian MSMEs, however, are nimble and are constantly adapting to new technologies. Therefore, with sufficient awareness creation and provision of easier access to technology and finance, they can successfully transition to EVs or other industries. To achieve this, regular and sustained ground-level engagement with MSMEs is necessary, creating roadmaps in a bottom-up manner to solve roadblocks and challenges, and highlight opportunities for technology, finance, skilling, and policy support.

- Government assistance should be sought for conducting periodic sensitization programs in partnership with agencies such as Automotive Research Association of India (ARAI), Automotive Skills Development Council (ASDC), International Centre for Automotive Technology (ICAT), appropriate research and academic institutions, and industry associations. Sensitization programs should cover EV-related quality and safety standards and technologies, EV policies of the central government and state governments, government schemes and incentives to help MSMEs set up EV manufacturing, and so on. Apart from helping build general awareness in the abovementioned areas, it is important to identify and focus on the specific skilling and technology gaps of MSMEs. The contribution of MSMEs to the EV industry would initially be in terms of repeated manufacturing of simpler components in larger volumes and at lower cost with much less scope for differentiation. Going forward, they will need to differentiate to create better products and value for customers, which will require them to work on filling the gaps in the industry in the areas of materials, battery technology, lighter designs, and better processes.
- The EV as an innovation also has sustainability at its heart apart from its other benefits; if the carbon footprint of EV manufacturing is not reduced, then EVs cannot be sustainable. It is therefore critical that the EV manufacturing industry—and especially MSMEs—start measuring their greenhouse gas footprint and develop capacities for reducing it. Awareness-building programs can also focus on this aspect to help MSMEs develop their technical knowledge and ability to access climate finance, which would enable them to switch to sustainable manufacturing processes and technology in both the short and long term.

2. Technology transfer

Based on the risk mapping discussed in the previous section, three kinds of transitions will be required in the MSME sector:

- **MSMEs manufacturing the ICEV parts involved in the first two technology shifts (engine parts, fuel delivery and exhaust systems; see Table 1) would be severely impacted because these components will become obsolete in the transition.** Thus, they would benefit from diversifying their businesses to either other similar manufacturing opportunities in other industries or completely new parts in EVs. However, a thorough mapping of their current skills and capabilities can help identify opportunities for them in the EV sector. For example, MSMEs with a tooling background could consider manufacturing connectors (which are currently being imported).
- **MSMEs not currently supplying to the automotive industry could find significant opportunities in the first two technological shifts (in EV motors and batteries; see Table 1).** Pump and motor MSMEs that currently supply primarily to the agriculture industry can explore the potential to manufacture EV motors (which are valued to be a $3 billion market by 2030) with manageable upgrades to their process machines (such as in the winding and magnet-based motors). Opportunities lie in casings, shells, castings, extrusions, machining, laminations, and stamping. Although advanced-level laminations and winding are currently limited in India, some initial investments can greatly increase their business. Similarly, building electronic and embedded software capabilities will greatly benefit MSMEs by improving their relevance to the EV industry. Batteries and BMSs are one such massive opportunity; these are currently mostly imported but can be indigenized with some initial capital investment. Challenges lie in the manufacturing costs of these components, as they depend on the import of expensive inputs such as magnets and lithium. Further, because the EV technology market is fast-moving, MSMEs too will need to make their design and manufacturing fast-paced and agile, by offering customized motors and forged wheels to OEMs that wish to differentiate their products. This is a challenge, because currently MSMEs are not accustomed to this.
- **MSMEs in the ICEV industry can tap into new opportunities in the EV industry through certain technology and process changes.** For example, ICEV MSMEs in ferrous casting can start exploring aluminum casting. This will require upskilling and repurposing machines, which can possibly be undertaken through a joint venture in the initial years. However, these shifts are complex and

will require consistent efforts on the part of MSME associations, industry experts, and the government to ensure that the MSMEs are given the right support in terms of building knowledge around these new technologies and processes, the right business models, market access to new buyers, quality standards and, most importantly, the financing and skilling needed to make these technology shifts. Coimbatore has historically been a hub of excellence in engineering and, with the right support, can truly demonstrate how an ICEV-EV transition can be planned in a just and inclusive manner.

- Other new opportunities presented by the EV industry that MSMEs can tap into are the following:
  - **Retrofitting:** This can be a transitional step toward EVs. It entails converting an ICEV into an EV by replacing the engine and other related parts in an old ICEV with an electric drivetrain (electric motor, drive shafts, and transmission), while retaining the structural framework, suspension, brakes, and headlights. This also helps increase the life of the vehicle and decreases the pollution it causes. However, several safety measures are necessary, and so retrofitting should be done only at approved governmental retrofitting facilities, and a standard certification process should be established to assure that a retrofitted vehicle is safe for plying on the road.
  - **Circular economy:** Recycling of EV batteries is important, not only to decrease the cost of manufacturing batteries (as 60 percent of the total battery cost is from its raw materials), but also to reduce the environmental impact of mining these raw materials and disposing of defunct batteries. Opportunities include using the batteries as renewable energy storage units. The Extended Producer Responsibility policy of the Government of India includes guidelines on the proper handling of battery waste, which will enable manufacturers to recover up to 90 percent of the material. Recycling challenges lie in newer composite materials that are entering the EV market because of their lightweight characteristic; however, they are difficult to recycle.

3. Finance

A just ICEV-EV transition will require robust financial support at various levels and for various endeavors. At the cluster level, financing will be required for research and development, sectoral infrastructure, common testing facilities, and so on. At the MSME level, finance will be required for investment in new technologies, skilling workers, and so on. These needs will have to be met using a variety of financial instruments offered by different financial organizations ranging from commercial bank loans to loans by public development banks (e.g., Small Industries Development Bank of India [SIDBI]) and government incentives (e.g., subsidies and credit guarantees) that reduce the cost of capital by bearing the associated risks (which are deemed to be high for MSMEs). Table 2 summarizes the initiatives by the Government of India, Government of Tamil Nadu, development banks, and climate finance funds.

The challenge lies in obtaining financing from banks, which are reluctant to provide loans to MSMEs due to the high risks involved as well as their limited awareness of changing technologies. On the other hand, venture capitalists and investors adapt faster to industry changes but are not as well connected with the MSME sector. Other innovative solutions such as leasing instead of purchasing new machinery are also not yet common in India. Thus, to improve financing for a just transition among ICEV MSMEs, the following are needed:

- More dedicated finance for a just transition, possibly through a fund linked to the EV policy
- Reduced documentation requirements to apply for funding
- Credit guarantees
- Instruments targeting micro and small enterprises
- Instruments for financing upskilling and reskilling of employees
- Credit instruments for women.

TABLE 2 | Supporting policies and schemes offered by the governments of India and Tamil Nadu

INITIATIVES BY THE GOVERNMENT OF INDIA (GoI)	
Credit Guarantee Fund Trust for Micro and Small Enterprises (CGTMSE)	▪ Guarantee on credits for loans up to ₹20 million, without third-party guarantee and collateral ▪ Guarantee on coverage ranging from 75% (others) to 85% (micro enterprise up to ₹500,000)
Micro & Small Enterprises Cluster Development Programme (MSE– CDP) – Existing MSMEs to apply in the form of a special purpose vehicle (SPV)	▪ Common facility centers: Construction of "tangible assets" such as processing center, testing facilities, design centers, including plug & play facilities. GoI assistance: Up to 80% of the project cost of maximum ₹300 million. ▪ Infrastructure Development: Development of drainage, power distribution, roads, and so on, in existing/new industrial estates/areas/flatted factory complex. GoI assistance: Up to 70% of the project cost up to a maximum of ₹150 million
INITIATIVES BY THE GOVERNMENT OF TAMIL NADU	
Tamil Nadu Credit Guarantee Scheme	▪ 90% guarantee for eligible loans of amount up to ₹4 million ▪ 80% guarantee for eligible loans of amount between ₹4 million and 20 million
Capital Subsidies	▪ For manufacture of EVs, EV components, EV supply equipment (EVSE), or EV charging infrastructure: 15% of the investment for a minimum investment of ₹500 million and creation of 50 jobs ▪ For manufacture of EV battery/advanced chemistry cells (ACC): 20% of the investment for a minimum investment of ₹500 million and creation of 50 jobs ▪ For MSME units engaged in manufacture of EV component or charging infrastructure: Additional 20% over and above the eligibility limit
Turnover-based Subsidy	▪ For manufacture of EVs, EV components, EVSE, or EV charging infrastructure: Up to 2% of the annual turnover, subject to an annual cap of 4% of the cumulative investment
Training Subsidy (for ICEV industries that transition or diversify into EV manufacturing)	▪ Upskilling allowance for up to 10% of the unit's workforce engaged on the EV production line as a training subsidy of ₹4,000 per worker per month for 6 months for residents of Tamil Nadu ▪ Additional ₹2,000 per worker per month for women and transgender employees, persons with benchmarked disabilities, and persons from the SC/ST communities
Other Subsidies and Benefits	▪ 100% reimbursement of SGST for 15 years from the date of production. (industries to choose between capital subsidy/turnover-based subsidy/reimbursement of SGST) ▪ Interest subvention of 5% on loans as a rebate on the rate of interest for 6 years. 6% for medium MSMEs on loans from Tamil Nadu Industrial Investment Corporation (TIIC) ▪ Land allotment at concessional rates in government industrial estates ▪ 100% electricity tax exemption for 5 years ▪ Green Industry Incentive of up to ₹10 million for adopting sustainable manufacturing practices per the Tamil Nadu Industrial Policy 2021 **For the policy period of Tamil Nadu Electric Vehicle Policy 2023:** ▪ Reimbursement of the employer's contribution to the Employees Provident Fund (EPF) for all new jobs created ▪ 100% stamp duty exemption ▪ 50% reimbursement on the cost incurred for intellectual property products up to a maximum of ₹10 million

INITIATIVES BY DEVELOPMENT BANKS	
SIDBI	▪ Credit guarantee schemes ▪ Collateral-free loans ▪ Up to ₹50 million under the Assistance to Re-Energize Capital Investments by SMEs (ARISE) initiative ▪ Low interest loans: 8% instead of 12–13% in commercial banks for machinery, and even lower for green projects such as solar rooftops, energy efficiency, mitigation, adaptation, waste to energy, waste management, and EVs
SIDBI and Google Partnership for Assistance to Micro Enterprises (SANGAM)	▪ Loans to MSMEs at an interest rate of 6% (5.5% for women-run enterprises)
Tamil Nadu Rural Transformation Project (TNRTP) by World Bank	▪ Financial assistance for skilling and job training
CLIMATE FINANCE	
Green Climate Fund (GCF)	▪ MSME Pilot Programme to provide financial assistance to MSMEs working in the supply chain for climate goods and services

Note: EV = electric vehicle; ICEV = internal combustion engine vehicle; MSME = micro, small, and medium enterprises; SGST = State Goods and Services Tax.

Source: Authors and interviewed stakeholders.

4. Reskilling and upskilling

Technology shifts, entering new industries, adopting new business models, and accessing new sources of finance (as discussed above) require knowledge, skill, and capability building of different kinds. Some areas that require skilling interventions are the following:

- **EV motors:**
  MSMEs with a strong engineering and mechanical skill base can adapt to the technological shifts of the transition. For example, electric pumps are only 30 percent different from conventional pumps and require only additional skilling in winding and stamping, which can easily be imparted with targeted skilling programs. Hence, electric motors are a low-hanging fruit for pump and motor MSMEs to enter the EV industry.
- **Electronic engineering for controllers and BMSs:**
  Whereas the ICEV manufacturing industry employs a large number of workers with low-level skills in mechanical engineering, the EV manufacturing industry will employ fewer workers with high-level electrical, electronic, and IT skills. Workers with these skills are currently not adequately available in India, especially with respect to the controllers needed to connect the motor and battery to regulate the vehicle's speed and acceleration. Therefore, India's engineering institutions must impart knowledge in mechanical engineering, electronics, and computer science, and all electrical and electronic engineering courses must have modules on EVs. Academic institutions must make a concerted effort to build capacity on EVs including for the controller, BMS, telematics, and mechatronics.
- **Retrofitting:**
  For retrofitting to be successful at a large scale, upskilling and reskilling of ICEV workers must be done, for example, on motors, automotive grade components, and the powertrain, and third-party testing centers could also be utilized for this purpose.
- **Business and development:**
  The ICEV-EV transition will also lead to fundamental changes in the structure of supply chains. In

the ICEV industry, MSMEs are accustomed to catering to the specific manufacturing needs of a few large OEM customers, and are equipped with the required technology and guidance. However, the EV sector is highly decentralized; therefore, to remain relevant, MSMEs will have to play the dual roles of development partners of OEMs and their manufacturing partners for both hardware and software. This will require significant upskilling on new business models and technology development.

- **Inclusion of women in the EV workforce:**
  Given that there are many more female software, electrical and electronics engineers in India than female mechanical engineers, the ability of the EV industry to include women in its workforce is as high as 80 percent. This potential is already being realized as women, with their "knack" for design and safety, are being preferred to their male counterparts, and 6 out of 10 new recruits in the EV industry tend to be women skilled in business modeling, design redevelopment, e-mobility, and renewable energy management. Further, women employees in the EV industry are being offered up to 35 percent more compensation than women in other sectors.

5. Government initiatives/schemes and governance

Policy support by the central and state governments is imperative for the EV transition to be successful. Currently, the EV Policy 2019 of Tamil Nadu provides some benefits such as a 20 percent capital subsidy for technological upgradation/EV manufacturing by MSMEs. The District Industry Centres (DICs) in Coimbatore and other districts also help implement the available schemes. Further, technology development centers are being developed by the Ministry of MSMEs, GoI, in Coimbatore, which will enable MSMEs to design and develop prototypes, take up re-engineering work, and train workers, making it easier for them to transition to EVs. FaMe TN is working under the Government of Tamil Nadu to set up an EV common facilitation center in Coimbatore to support the EV mega-cluster.

However, certain governance challenges persist, such as tracking the number of MSMEs that benefit from the current schemes, or even simply creating a database of all registered MSMEs. To address this lacuna, the Tamil Nadu government is redesigning schemes and portals to collect data and reduce waiting lists for popular schemes such as the capital subsidy scheme. Tamil Nadu is the first state in India to make a list of all the registered MSMEs so that the state government can connect MSMEs with vendors. It is also preparing IDs for MSMEs with a system connected to the treasury that can guide MSMEs in applying for specific schemes that will give them the maximum benefit and will also notify them when the subsidy has been disbursed.

RECOMMENDATIONS AND ENTRY POINTS

1. Awareness

Steps must be taken by the central government and the state governments for large-scale awareness creation among MSMEs regarding the specific changes that are underway in the automotive sector and the possible implications for them. Periodic webinars and in-person workshops for MSMEs could be conducted at the district level through institutions such as DICs to help develop their awareness of industry developments and their implications for MSMEs. Experts from industry, MSME associations, and civil society organizations could be invited to such workshops to integrate their efforts and to facilitate interventions through strong local institutions, which can prove successful.

2. Technology

- For effective technological development, create a space where MSMEs can test their products.
- Bring the software, automobile, and manufacturing industries together because technological development will no longer be concentrated within OEMs but will be distributed across multiple channels, and MSMEs must be effectively equipped to play the role of technology developers as well.

- Bring all the stakeholders together, such as governments, MSMEs, start-ups, representatives from National Institution for Transforming India (NITI Aayog), heavy industries, and technology centers, to address the need for technological upgradation.
- Develop the technology for electrical traction motors, for which India has the ecosystem but not the design. This is important to avoid importing them from China.
- Discuss the development of the infrastructural network of charging stations.
- Shift grid electricity from thermal to renewable energy so that EVs can truly contribute to decarbonization.
- Technology centers must be adapted in consultation with OEMs to provide effective technological support to MSMEs.
- MSMEs require technical support to adapt to the transition, and institutions such as MSME Business Forum India plan to offer services that can be utilized by MSMEs, such as battery swapping, e-mobility platforms, open charge point interface roaming solutions, smart energy platforms, and EV fleet platforms.

3. Finance

- Bring investors and banks on one platform to understand their perspectives and convince them to support the ongoing transition.
- Maximize coverage by extending the capital subsidy scheme to both, new and existing MSMEs, in order to improve access to finance.
- Include schemes in the state EV policy that specifically support MSMEs threatened by the EV transition.
- Develop finance instruments specifically for micro MSMEs.
- Institutions such as MSME Business Forum offer leasing options (via investors) for industries and institutions that are keen on adopting or transitioning to the EV sector. These options can be utilized by MSMEs.

4. Reskilling and upskilling

Reskilling and upskilling exercises must be widely organized for MSMEs to enable them to switch to EV-based job roles. Some areas are the following:

- **Data collection and skill mapping:**
  - Map all MSMEs, and build a database to track them.
  - Conduct a comprehensive risk mapping exercise that identifies the specific skills needed. This will help develop the extensive curriculum and ensure that the right skilling programs are delivered.
  - Provide certification by nationally recognized agencies such as ASDC or National Skill Development Corporation for the skilling programs conducted.
- **Awareness building:**
  - This must be the first level of training for all MSMEs and engineering students.
- **Skilling programs:**
  - Identify relevant skilling needs for business owners, engineers, shopfloor workers, etc. and provide extensive, hands-on, practical knowledge in the area.
  - Provide certificates for all training. Identify and coordinate with agencies that can impart training.

- Organize these skilling programs at a large scale, focusing not only on the new youth entering the industry but also on existing MSMEs.

- **Academic training:**
  - The EV sector needs software engineers who understand power electronics, control electronics, how the battery works, and how the motor works, and can also integrate this knowledge. For this, initiatives by ARAI and CODISSIA can be entry points. ARAI is conducting courses in MTech and BTech programs in electric mobility, and has identified a syllabus consisting of short-term courses, certification courses, postgraduate diploma courses, and so on.
  - CODISSIA has started an incubation center to conduct reskilling programs and also has entered into MoUs with engineering colleges to help prepare engineers for industry by conducting short six-month industry-based training programs during or after college. To achieve this, a panel of experts and OEMs and a team within CODISSIA can be formed.

- **Institutional setup for training:**
  - Centers of excellence such as the Tamil Nadu Centre of Excellence in Advanced Manufacturing (TANCAM) are being set up all over Tamil Nadu to promote skilling as well as research and development. These centers can serve as entry points for skilling endeavors. The Indian Institute of Technology (IIT) Palakkad has launched a course called "Lean Manufacturing Practices for EV" in a tie-up with Automotive Component Manufacturers Association (ACMA).
  - Bring together OEMS, MSMEs, financial institutions, engineering universities, professional agencies such as Society for Smart E-Mobility (SSEM), industrial training institutes, and governments (both the central government and state governments) to build a skilling ecosystem suitable for the EV market in India.

- **Technology focus areas:**
  - Develop upskilling programs for ICEV MSMEs on retrofitting and testing in Coimbatore and elsewhere in India.
  - Build programs to adapt existing skills on stamping and winding to the EV sector.

- **Inclusion of women:**
  - Prioritize hiring women in the assembly line, software-related roles, separating the magnets for electric motors, and so on.

- **Product development:**
  - OEMs are increasingly looking at MSMEs as development partners instead of just component manufacturers; therefore, MSMEs must be equipped with necessary skills to enable them to contribute.

5. Policy support

- **Support for technologies:**

  Support R&D, product development in MSME clusters, setting up of common facility centers, testing centers, and other such supporting infrastructure.

- **Support for finance:**

  Create new schemes to support access to finance for at-risk MSMEs, new entrants into EVs, micro MSMEs, and so on.

- **Support for skilling:**

  Support and encourage the development of training programs to upskill current workers in MSMEs on new business ventures, especially if they can prove that they are threatened by the EV transition. Emphasize training women to help them enter the EV industry.

- **Enhance the inclusion of women:**

  Provide incentives for the skilling and hiring of female employees. Develop better market connections between the source of female labour and the hiring MSMEs.

- **Develop a skilling ecosystem:**

  Bring together OEMS, MSMEs, financial institutions, engineering universities, industrial training institutes, the central government, and state governments to build a skilling ecosystem suitable for the EV market in India.

- **Facilitate market access:**

  Connect MSMEs with potential buyers in new EV and allied industries to smooth the transition process.

- **Policy/regulatory framework and planning:**

  The government must prepare a robust regulatory framework to ensure a just transition. It must also create a roadmap for EV development that can guide MSMEs on where to make investments, and which technologies and skills are needed.

WAY FORWARD FOR THE INDIAN AUTOMOTIVE SECTOR

The EV industry has the potential to create tremendous new opportunities in the Indian market, both from domestic consumption and exports. However, it will lead to a fundamental change in the nature of the automotive industry in terms of the structure of the supply chain, products, processes, materials, skills required, servicing, and so on. To truly align it with India's development goals, it must be ensured that the current vulnerability of MSMEs does not hinder them from tapping into these opportunities or adapting to large-scale, long-term, industry-wide shifts. For this, all major stakeholders, including OEMs (which are spearheading the implementation of the EV transition and which are the main customers of MSMEs), governments (which are driving the direction of the transition), MSME associations, academic institutions, and financers such as SIDBI must come together and plan the transition so that it not only focuses on building the EV sector but also looks at the high- and medium-risk MSMEs in the ICEV industry. This plan must thus be embedded in both the EV transition plans of OEMs as well as the state EV policies.

APPENDIX A

Stakeholders consulted

Thiru Srinivasan,
MD, ePropelled India
Panelist and Roundtable Participant at launch event;
Speaker at workshop for Motor MSMEs,
One-on-one discussion

Dr. Shankar Venugopal,
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Panelist and Roundtable Participant at launch event;
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FaMe Tamil Nadu
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Ravi Nandan Sinha,
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G.R. Mohan,
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One-on-one discussions

T.P. Sivasankari,
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One-on-one discussion through industrial visit

M.S. Vijayaraghavan,
Laghu Udyog Bharati
Roundtable Participant at launch event,
One-on-one discussions

K. Mohan Senthil Kumar,
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Roundtable Participant at launch event,
One-on-one discussion through industrial visit

D. Vignesh,
President, Southern India Engineering Manufacturers' Association (SIEMA)
One-on-one discussion during industrial visit

Ma. Sendilkumar,
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P. Ponram,
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One-on-one discussion

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Panelist at launch event

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FaMe Tamil Nadu
Roundtable Participant at launch event

A. Vijayan,
FaMe Tamil Nadu
Roundtable Participant at launch event

M.B.L. Khan,
Small Industries Development Bank of India (SIDBI)
Roundtable Participant at launch event

C. Vasantharaj,
Society for Smart E-Mobility (SSEM) & Kumaraguru College of Technology (KCT)
Roundtable Participant at launch event

Dr. C.B. Senthil Kumar,
Tamil Nadu Electricity Consumers Association (TECA)
Roundtable Participant at launch event

Prabhu Aravind R,
mByom
Roundtable Participant at launch event

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Laghu Udyog Bharati
Roundtable Participant at launch event

P.N. Prasad,
Business Head, Powertrain & EV Testing,
ATS Technologies
Speaker at workshop for motor MSMEs

R. Arjun,
CEO, Veesaa Foundry, Coimbatore
One-on-one discussion during industrial visit

Vignesh Rathinakumar,
MD, Alumina India Die-Casting Company, Coimbatore
One-on-one discussion during industrial visit

K. Easwaran,
Managing Partner, Sakthi Gear Products, Coimbatore
One-on-one discussion during industrial visit

Anuradha Shankar,
CEO, TECHIN, IIT Palakkad
One-on-one discussion

P.K. Banerjee,
Chief Executive Director, Society of Indian Automobile Manufacturers (SIAM)
One-on-one discussion

Amol A. Gokhale,
Professor, Mechanical Engineering, IIT Bombay
One-on-one discussion

N. Prabhu,
Treasurer, Indian Institute of Foundrymen, Coimbatore Chapter
One-on-one discussion

Dr. Arunvinay Prabakaran,
Technical Director, Dietech India Pvt Ltd
One-on-one discussion

Uttam Kumar,
Assistant Director, Indian Electrical and Electronic Manufacturers Association
One-on-one discussion

Uday Sankar Yerramilli,
Cofounder and Director, USPI Consulting Pvt. Ltd.
One-on-one discussion

Anil Kumar Unni,
Deputy Executive Director, ACMA
One-on-one discussion

Karthick Athmanathan,
Senior Vice President, Ashok Leyland
One-on-one discussion

Ramanathan Srinivasan,
Managing Director, ATS Technologies
One-on-one discussion

Abbreviations

ACC: Advanced chemistry cells

ARAI: Automotive Research Association of India

ATS: Automotive Test Systems

CEO: chief executive officer

CGTMSE: Credit Guarantee Trust for Micro and Small Enterprises

CODISSIA: The Coimbatore District Small Industries Association

EV: Electric vehicle

EVSE: EV Supply Equipment

FaMe TN: Facilitating MSMEs of Tamil Nadu

GCF: Green Climate Fund

ICAT: International Centre for Automotive Technology

ICEV: Internal combustion engine vehicle

IIT: Indian Institute of Technology

LUB: Laghu Udyog Bharati

mByom: mByom Consulting and Management Services LLP

MoU: memorandum of understanding

MSME: Micro, small, and medium enterprise

OEM: Original equipment manufacturer

SANGAM: SIDBI and Google Partnership for Assistance to Micro Enterprises

SC: Scheduled Caste

SIDBI: Small Industries Development Bank of India

SIDCO: Small Industries Development Corporation

SIEMA: Southern India Engineering Manufacturers' Association

SITARC: Scientific and Industrial Testing and Research Centre

SSEM: Society for Smart E-Mobility

ST: Scheduled Tribe

TANCAM: Tamil Nadu Centre of Excellence in Advanced Manufacturing

TECHIN: Technology Innovation Foundation of IIT Palakkad

TIIC: Tamilnadu Industrial Investment Corporation

TNRTP: Tamil Nadu Rural Transformation Project

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ABOUT WRI INDIA

WRI India is a research organization that turns big ideas into action at the nexus of environment, economic opportunity and human well-being.

Our challenge

Natural resources are at the foundation of economic opportunity and human well-being. But today, we are depleting Earth's resources at rates that are not sustainable, endangering economies and people's lives. People depend on clean water, fertile land, healthy forests, and a stable climate. Livable cities and clean energy are essential for a sustainable planet. We must address these urgent, global challenges this decade.

Our vision

We envision an equitable and prosperous planet driven by the wise management of natural resources. We aspire to create a world where the actions of government, business, and communities combine to eliminate poverty and sustain the natural environment for all people.

Our approach

COUNT IT

We start with data. We conduct independent research and draw on the latest technology to develop new insights and recommendations. Our rigorous analysis identifies risks, unveils opportunities, and informs smart strategies. We focus our efforts on influential and emerging economies where the future of sustainability will be determined.

CHANGE IT

We use our research to influence government policies, business strategies, and civil society action. We test projects with communities, companies, and government agencies to build a strong evidence base. Then, we work with partners to deliver change on the ground that alleviates poverty and strengthens society. We hold ourselves accountable to ensure our outcomes will be bold and enduring.

SCALE IT

We don't think small. Once tested, we work with partners to adopt and expand our efforts regionally and globally. We engage with decision-makers to carry out our ideas and elevate our impact. We measure success through government and business actions that improve people's lives and sustain a healthy environment.

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