EXECUTIVE SUMMARY

On May 31, 2022, the National Institution for Transforming India (NITI Aayog) and World Resources Institute India (WRI India) hosted a webinar titled “Just Transition and Skill Development in the Electric Vehicle (EV) Industry.” The webinar was part of the “Forum for Decarbonizing Transport” under the NDC-Transport Initiative for Asia. It included two panel discussions on the impact of the ongoing EV transition on the workforce of the automotive and transport industries and deliberations on ways to ensure a just transition and develop the skills of the workforce.

In two sessions, the panelists (see Appendix A) highlighted the pressing need to support skilling, upskilling, and reskilling of the automotive sector workforce as the ongoing EV transition changes the nature of jobs in the industry. The webinar underscored the magnitude of the anticipated changes in the employment landscape, such as job losses and job creation, the potential for high-quality green jobs, the need for skilling and reskilling initiatives, and the policy support needed to navigate the ongoing transition to ensure equitable and just outcomes.

Some of the key insights and recommendations provided by the panelists were the following:

- Map and measure the employment impacts at the organizational, regional, and national levels.
• Provide policy support to encourage the development of niche and scalable jobs.
• Recognize the critical role of original equipment manufacturers (OEMs) in shaping the EV ecosystem and guiding the transition.
• Forge academia-industry partnerships to create adaptive skilling and education programs.
• Ensure that regional development continues to thrive during the EV transition.
• Create awareness to establish electric mobility as a primary career option.
• Leverage the transition to create a more inclusive workforce with adequate representation for women and marginalized communities.
• A just transition must be based on social dialogue among employers, workers, and governments.

Introduction

The NITI Aayog and WRI India hosted a webinar on May 31, 2022, titled “Just Transition and Skill Development in the Electric Vehicle Industry” as part of the “Forum for Decarbonizing Transport” under the NDC-Transport Initiative for Asia. The webinar brought together policymakers, industry leaders, academia, and researchers to discuss the need for a just transition in the automotive and transport sectors. In two sessions, the webinar discussed the importance of skill development programs in the automotive sector workforce for the transition to electric mobility. The webinar highlighted key aspects of the anticipated job changes, job losses and job creation, prospects for high-quality green jobs, the need for skill development initiatives, policy support, and best practices needed to navigate the transition for just outcomes.

Some critical questions that the webinar aimed to answer were the following:

• How does the EV transition provide new opportunities to states for economic growth and job creation?

• How can we minimize adverse impacts on the existing workforce and seize the opportunity to create more inclusive and higher-quality jobs during the transition from internal combustion engine (ICE) vehicles to electric vehicles (EVs)?

• What are the skill development requirements, at the national and state levels, to optimize employment opportunities and reduce skill shortages during the EV transition?
Ensuring a Just Transition

The Indian automotive and transport industries are poised to shift rapidly from conventional ICE to EVs. This transition is expected to be accompanied by significant changes in technology, production processes, and consumption patterns, which in turn will impact employment generation in these industries. To enable more socially inclusive and equitable outcomes (besides environmental sustainability), India needs to ensure that the journey to a low-carbon future follows a just transition.

As electric mobility becomes mainstream, several parts of the traditional automobile value chain—across the manufacturing, sales, and service sectors—will become obsolete, some will change fundamentally, and entirely new industry segments will be introduced (see Figure 1).

![Changing Automotive Value Chain for EVs](image)

**Figure 1 | Changing Automotive Value Chain for EVs**

*Note: EV = electric vehicle; EVSE = electric vehicle supply equipment; OEM = original equipment manufacturer
Source: Compiled by WRI India*
Some vital aspects of this transitional journey are the following:

- The conventional vehicle powertrain consisting of an engine, transmission, and drivetrain will shift to batteries, motors, and a host of other electronic components such as the control unit, battery management system, and thermal management system.

- With the adoption of EVs, the research and development (R&D) landscape will grow substantially. The EV ecosystem is more data intensive compared with the traditional ICE vehicle ecosystem, with the result that new data services and business models will be created.

- The usage of materials such as copper, semiconductors, and earth metals (lithium, cobalt, etc.) is also likely to rise with increasing EV uptake.

- The EV powertrain has different servicing needs compared with the conventional ICE powertrain.

- As EVs have fewer mechanical parts, automotive dealers are likely to experience a decrease in aftersales revenue and affiliated jobs.

- As EV repairs require sophisticated electronics, the role of traditional roadside mechanics is likely to diminish. At the same time, with the increasing need for servicing batteries and other electronic components, authorized service centers will become more important.

- As EV deployment scales up, battery recycling will become increasingly important.

- With fuel requirements pivoting from fuel pumps to charging stations, workforce requirements in this segment may plummet with the increasing automation of EV charging and maintenance.

- Over time, much of our know-how and technologies is likely to become less useful, which will make it necessary to adopt newer technologies to ensure a smooth electric mobility transition.

These impending changes are likely to result in job losses in the traditional ICE vehicle industry, while simultaneously creating new employment opportunities in the EV industry. These jobs will require new skill sets, for which the existing workforce must be upskilled even as new workers get trained. Further, these opportunities must be exploited to improve the readiness of youth entering the job market and increase the representation of women and marginalized groups in the workforce.

**Pathways for Skill Development**

Skill development is the basic pre-requisite for industrial growth, especially for an industry in transformation. With increasing EV deployment, there is a critical need to create a sustainable ecosystem for the long-term growth of this industry. Development of new skills will address the “fear of change” and make the job market more receptive to new EV technologies. Similarly, the ready availability of trained employees will improve productivity and reduce cost for companies while facilitating a rapid EV transition. At the national level, a holistic upskilling and reskilling ecosystem will create more employment opportunities, both within and outside the automotive sector. Figure 2 highlights the importance of skill development for the EV industry.

As the deployment of EVs significantly changes the automotive value chain, it is critical to unlearn old skills and develop new navigation strategies. For example, as the internal design elements of EVs are different from those of ICE vehicles, EV vehicle design courses will have to be created. The EV industry in India currently faces a shortage of several skill sets across the value chain, from
vehicle design to repair and maintenance. Although skill gaps affect the entire value chain, it is crucial to focus on priority areas to ensure a seamless EV transition. Some critical areas for skill development include EV driving and maintenance, product design, battery and vehicle assembly, and charger installations.

EV skill development currently faces the following challenges:

- **Lack of women participants:** The transport industry is male dominated, with a dire lack of opportunities for women’s participation.

- **Lack of industry standards:** As EVs are a new age technology, there is a lack of industry standards for job roles, curricula, training methodologies, and so on.

- **Lack of industry support:** The EV market in India is dominated by several small enterprises that do not have the resources to facilitate large-scale skill development initiatives.

- **Small market size:** Accounting for a mere 1.3 percent of the total vehicle sales in India in FY 2020–21 (*Saur Energy International Magazine*, 2021), the EV industry is still nascent and is thus unable to attract the multi-stakeholder attention required for a holistic approach to skill development.

Appropriate skilling of the workforce will ensure a sustainable transition of the formal and informal sectors. The deployment of skill development programs at scale will also ensure the sustained growth of the e-mobility industry, which currently relies on internal skilling processes for workers and supply chains.
Webinar Outcomes

This section highlights the key insights and recommendations provided by the webinar panelists. The sessions helped identify important data gaps and the analyses required for the sustained and targeted growth of the EV industry. More importantly, these insights represent the beginning of an important new initiative; bringing a sense of cohesion and collective purpose among academic, government, private sector, and civil society actors so that they can work together to create the next generation of strategies that can accelerate the decarbonization of the transport sector.

Key Lessons and Entry Points for Action

1. **Map and measure the employment impact at the organizational, regional, and national levels**

The EV transition will have cascading impacts across the automotive value chain, at multiple levels. The largest disruption will take place in automotive component manufacturing. ICE and transmission component manufacturers, for instance, will witness large-scale product obsolescence. In parallel, there will also be greater employment opportunities in segments such as electric motors, controllers, drivetrains, and associated software. Powertrain pump manufacturers will shift from mechanical to electric pumps and may tap new areas such as battery and motor cooling systems.

As EVs have fewer parts, the vehicle maintenance segment is also likely to witness rapid changes. Furthermore, the whole ecosystem of petroleum fuel exploration, refining, and distribution—
currently responsible for a significant share of employment in the country—is also likely to shrink significantly. These jobs are likely to be replaced by a comparably wide network of jobs in charging infrastructure, power generation, battery management, and disposal systems. EVs are more software intensive than ICE vehicles, which will help create new information technology (IT)–related jobs.

Apart from the EV transition, parallel trends such as the growth of mobility as a service and greater automation in manufacturing may also lead to job losses and accelerate the changing dynamics in the automotive industry.

Christian Hochfeld, Executive Director at Agora Verkehrswende, mentioned that a study on technology and the EV transition in the automotive sector in Germany estimates that nearly every second job in the traditional automotive industry will have to be reskilled. Although this shows the magnitude of the challenge, it also hints at a sizable opportunity that can be exploited. Overall, the study indicates that the aggregate number of jobs in the economy can be maintained up to 2030, provided there is adequate reskilling supported by job creation in ancillary sectors.

A deeper analysis of the ongoing EV transition in India is required to understand the magnitude and areas of job losses and to identify new skilling and reskilling requirements. Without a careful and thorough analysis and appropriate follow-up measures, the adverse social impacts may create undue political pressures that can dampen the shift to EVs.

**ENTRY POINTS FOR ACTION:** There is a critical need to map the employment impact at the organizational, regional, and national levels. This should include the entire value chain and the key sectors that will be affected by the transition. This exercise will help us understand the gaps between the current and required skillsets, which in turn will enable us to plan future skill development pathways.

2. **Policy support is necessary to encourage the development of niche and scalable jobs**

The EV transition has tremendous potential to support India’s economic growth through employment generation across multiple new areas. First, the transition is likely to create niche jobs that will be more R&D focused and related to, for instance, battery technology, their management systems, and recycling. Similarly, an increasing number of scientific researchers will be required to continuously innovate to meet the needs of fast-developing EV technologies. Academic programs and research facilities must be developed to support research capabilities in the sector.

Second, the transition is likely to encourage the creation of scalable jobs in the downstream segment of the value chain, necessitating a substantial level of skill development. For instance, handling EVs is quite different from handling ICE vehicles, making it important to train and educate drivers on the unique nature of these vehicles. Similarly, roadside mechanics will require reskilling to be able to service EVs and to seek re-employment opportunities in the changing landscape.
The transition will also generate more opportunities for new entrepreneurs. For instance, entrepreneurs may meet the increasing demand for battery swapping for commercial vehicles by setting up battery swapping stations. The ubiquitous kirana (corner grocery stores) outlets can, in turn, serve as easily accessible locations for battery swapping points. It is vital that the policy ecosystem foster the growth of such entrepreneurial efforts.

**ENTRY POINTS FOR ACTION:** The disparate skilling, reskilling, and educational needs of the workforce underline the importance of differentiated strategies to target both high-skilled and low-skilled jobs in the EV industry. These strategies will help attract new talent to the industry and also help train the existing workforce.

States will require robust policy support and institutional resources to channelize the existing and new workforce toward the EV industry. States such as Telangana and Karnataka have already taken steps in this direction. Telangana's state skill development agency, Telangana Academy for Skill and Knowledge, is well positioned to assess, prepare, and train workers for the anticipated employment opportunities in the EV industry. Karnataka has begun collaborating with technology and industry partners to create a curriculum for industrial training institutes. The Karnataka government's collaboration with Tata Technologies and Siemens for such curriculum development is a case in point.

States must also collaborate with knowledge-focused institutions to support the growth of the EV industry. For instance, in Hyderabad, the International Advanced Research Centre for Powder Metallurgy and New Materials (ARCI) has developed a type of battery chemistry that can withstand the extremely hot climatic conditions of India.

3. **OEMs will play a critical role in shaping India’s EV roadmap and guiding the transition**

OEMs will play a critical role in creating a solid roadmap for the EV industry and guiding other stakeholders, such as suppliers, dealers, and consumers, through the transition.

In the ICE vehicle industry, the technology is embodied by the engine itself, which is the sole responsibility of OEMs. However, in the case of EVs, batteries are best manufactured by specialized companies that emphasize continued innovation in battery chemistry and design. Similarly, drivetrain parts are manufactured by multiple companies. This diverse landscape demands greater collaboration in EV manufacturing, with EV OEMs working closely with component manufacturers.

OEMs can help ICE vehicle component suppliers navigate the EV transition, reposition themselves, and reskill their workforce accordingly. For instance, manufacturers of fuel tanks for the current ICE vehicle industry may pivot to manufacturing cooling systems for batteries. OEMs, along with the government, can provide a clear roadmap for this transition, allowing the multi-tier component manufacturing ecosystem sufficient time to equip themselves for the change.
Similarly, manufacturers can help dealers tailor their sales and servicing offerings to suit the requirements of the EV industry. They will also be required to lead reskilling initiatives, within their companies and beyond, to ease the transition. Hero Electric, for instance, has taken up the initiative to reskill over 8,000 roadside mechanics to enable them to service EVs. Moreover, the company has set targets to reskill at least 10,000 roadside mechanics every year.

**ENTRY POINTS FOR ACTION:** The crucial role of vehicle manufacturers in the EV transition points toward the need for effective and continued collaboration. To facilitate such partnerships, the industry will need to become horizontal. Further, existing industries, such as electronics, will need to be aligned with the requirements of the EV industry.

4. **Academia-industry partnerships are necessary to create adaptive skilling and education programs**

The rapidly evolving EV industry cannot be restricted to vehicles and their components. The drastic imminent changes will transcend traditional manufacturing activities, making it essential to consider skilling requirements across the entire ecosystem. For example, power generation and distribution companies are now dealing with cyber security, phishing scams, and big data, requiring them to train their workforce to handle data security concerns. Although skill addition is required across the value chain, it is particularly important to upskill the workforce in R&D and service engineering to strengthen high-value manufacturing and technology creation.

OEMs are currently tackling skill gaps in the EV industry by providing on-the-job training to the workforce. As OEMs shepherd the first life cycle of their products, over the next few years it will be their responsibility to regularly share technological advancements, learnings,
and requirements with academia and help educators create EV-related courses that are in line with the latest industry developments. A trained workforce will in turn reduce labor market bottlenecks that would otherwise hamper a smooth EV transition.

EV courses must train students to analyze the architecture of various EV segments, design the drivetrain, troubleshoot faults, repair and retrofit components, and study the impact of EV integration on the power distribution system, among other skills. Institutions such as the Delhi Skill and Education University (DSEU) are planning to integrate EV-related curricula in their existing engineering courses to train engineers in both ICE and EV technologies. In addition to long-term courses, short-term vocational courses are also being introduced to train the workforce. For example, Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH (GIZ), in collaboration with Indian Institute of Technology (IIT) Bombay, has developed a vocational course syllabus for EVs to train students and future jobholders.

**ENTRY POINTS FOR ACTION:** Multi-stakeholder collaborations between academia, industry, and government are important for upskilling the EV workforce. Development of the core curriculum should be supported by practitioners and industry leaders who helm the EV transition and understand its changing requirements. To encourage skill development and ensure a bigger EV-ready workforce, universities must engage in reskilling and training.

5. **It is important to ensure that regional development continues to thrive during the EV transition.**

Although the total number of jobs in the economy may remain stable through the EV transition, there will inevitably be some shifts in automotive sector jobs between geographic regions. Automotive jobs may move from one region to another due to the development of new EV and EV component clusters. Although skilling pathways can enable job mobility for workers, it is equally important to strengthen regional economies that lose automotive sector jobs.

As some jobs become obsolete, the associated skill sets can be utilized in other jobs that open up in the same region. Jobs are likely to be created in ancillary sectors such as EV financing and operations and maintenance at power plants to support the charging infrastructure ecosystem. Moreover, skill sets that become redundant in the automotive sector may be transferred to other manufacturing sectors.

While we focus on bridging the skill gaps, we must strive to preserve the vibrancy of regional economies. This can be done by supporting the micro, small, and medium enterprises (MSMEs) in the automotive and transport industries. MSMEs play a key role in balancing regional development and can generate the impetus to sustain automotive and transport activity in a region by attracting investments and developing the talent pool necessary to support the EV transition.

If the EV transition results in a reduced role for the automotive sector in a region, other businesses or industries should be cultivated as a replacement to sustain the workforce and the economy.
ENTRY POINTS FOR ACTION: Steps must be taken to ensure that regions with large traditional automotive industries continue to thrive during the EV transition. For example, Germany implemented three initiatives to safeguard regional development: skilling platforms were established in collaboration with industry in several states having large automotive clusters, a national platform was established to enable strategic dialogues at the state and national levels, and a national fund was created to help MSMEs reposition themselves for the EV industry and adopt new business models. A similar proactive approach will be needed in India to ensure that existing automotive clusters continue to thrive even as the development of the automotive industry in other states is supported.

6. Awareness must be created about electric mobility as a primary career option

With 29 years being the average age of the population, India is one of the youngest countries globally (Economic Diplomacy Division, Ministry of External Affairs 2021). The future of the EV industry therefore lies in the hands of youth. Although youth in India are interested in EV-related jobs, they have reservations about the prospects, remuneration, skill requirements, and overall sustainability of the sector. Consequently, electric mobility is often seen as a secondary career option.

Lack of awareness among youth is the major reason why the EV industry is not seen as a full-fledged career option. Creating awareness is therefore critical for the industry’s growth so that youth can view it as a promising career path.

ENTRY POINTS FOR ACTION: The EV industry’s linkages with the existing network of organizations and interest groups, such as factory owners, industry associations, and MSMEs, are essential for integrating youth in EV skill development programs. In addition, industry partnerships with development agencies such as the United Nations Development Program (UNDP) can create programs targeted at youth—for example, by providing stipends for on-the-job training. Such partnerships and collaborations are crucial for cultivating the next-generation EV industry workforce.

7. The EV transition must be leveraged to create an inclusive and diverse workforce

The automotive and transport industries have historically had an abysmally low representation of women in the workforce, due in large part to the gender stereotypes prevalent in these industries. However, we are now witnessing a slow change in the status quo, with more girls and women taking up training courses and entering the automotive industry workforce.

The transition to EVs, which is expected to create millions of jobs, holds immense promise for catalyzing inclusion and reducing the existing gender imbalance in the workforce by absorbing women across the spectrum—from the shopfloor to the boardroom. EVs have fewer components and require less technical knowledge, making the industry a good fit for women, particularly in repair- and maintenance-related jobs.
Compared with the traditional automotive industry, more women are in leadership roles in the EV industry, and they can help develop women-friendly policies and serve as role models to further encourage women’s participation.

**ENTRY POINTS FOR ACTION:** Policy-level interventions and collaborations with civic service institutions are needed to ensure inclusion at every stage of the EV value chain and for all job roles. Women should be engaged at every stage of the process, from education and skill development to job opportunities in the sector.

8. **A just transition must be based on social dialogue among employers, workers, and governments**

A just transition, as defined by the United Nations and the International Labor Organisation, is characterized as follows: no one left behind, stakeholder engagement, and a social dialogue between unions, workers, and companies.

All efforts must be made to consider the continued welfare and well-being of the workforce during this transition. According to Samantha Smith, Director of the Just Transition Centre (an initiative of the International Trade Union Confederation), about one-third of the current jobs in today’s ICE vehicle ecosystem are likely to be obsolete in a few years. Although jobs may be created in other sectors, the pathways for reskilling and re-employment are not always clear-cut. Therefore, policies should aim to demystify the automotive sector and the impact of the EV transition. This should include tripartite social dialogue among employers, trade unions, and city, state, and national governments to understand the current and anticipated skill requirements of the automotive workforce.

The large number of jobs in the automotive sector underscores the importance of having this dialogue about managing the transition seamlessly. It is necessary to develop platforms for collective bargaining and transition planning. For instance, one of the Indian affiliates of the Just Transition Centre of the International Trade Union Confederation (ITUC) has a collective bargaining agreement with Coal India that covers permanent, contractual, and informal workers in case of restructuring, closures, or other changes in the sector.

It is important to ensure a just transition for contractual/informal workers as well. There is a huge unorganized sector that manages electronic waste, which will now be tasked with recycling EV batteries. This will be an opportunity for them to generate wealth from waste while ensuring its safe disposal. However, battery waste is toxic and hazardous, and jobs in the recycling value chain therefore need to be made safe to ensure a just transition for informal workers.

**ENTRY POINTS FOR ACTION:** A just transition entails supporting workers in the automotive industry whose jobs are at risk. If they cannot be reemployed, they should be supported through compensation programs for the period of unemployment. Further, a platform must be built to exchange knowledge about best practices and facilitate collective bargaining, social dialogue, and transition planning.
Next Steps

The webinar's key objective was to initiate a dialogue around the central issues shaping a just transition and skill development in the EV industry. As the outcome of the webinar suggests, a multi-stakeholder approach is essential to achieve this goal. WRI India will work in partnership with different stakeholders toward the following:

- Map the employment impacts on the auto industry at the organizational, regional, and national levels to understand the current skillsets and the readiness of companies, regions, and states for the EV transition.
- Help states collaborate with knowledge-based institutions and technology-driven industries to support industry growth and skill development.
- Bring industry players, government, and academia on a common platform to share knowledge, identify best practices, and promote partnerships through webinars, forums, and workshops.
- Develop EV upskilling programs in association with the government, industry, academia, think tanks, and other stakeholders.
- Foster a dialogue between women leaders in the EV industry, policymakers, and civic service institutions to help develop policies that promote women's representation in the workforce.
- Encourage academia to create awareness among women to take up EV skill development courses and create a mentorship program allowing them to shadow senior women leaders from the industry.
APPENDIX A

Webinar Participants

Chaitanya Kanuri, Senior Program Manager, Electric Mobility, WRI India

Christian Hochfeld, Executive Director, Agora Verkehrswende

Divya Jain, State Project Head, United Nations Development Programme (UNDP)

Garima Agrawal, Program Manager, Electric Mobility, WRI India

Gunjan Krishna, Commissioner, Department of Industries and Commerce, Government of Karnataka

Jai Bharathi Addepalli, Founder and CEO, MOWO Social Initiatives Foundation

Jayesh Ranjan, Principal Secretary, Department of Industries and Commerce & IT, Government of Telangana

Madhav Pai, Program Executive Director, WRI India Ross Center

Naveen Munjal, President, Society of Manufacturers of Electric Vehicles (SMEV) & Managing Director, Hero Electric Vehicles Pvt. Ltd.

Navonil Das, Technical Advisor, Indo-German Programme for Vocational Education and Training, at Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

Neharika Vohra, Vice Chancellor, Delhi Skill and Entrepreneurship University (DSEU)

OP Agrawal, CEO, WRI India

Pawan Mulukutla, Director, Clean Mobility and Energy Tech, WRI India

Samantha Smith, Director, Just Transition Centre, International Trade Union Confederation (ITUC)

Siddharth Sinha, Public Policy Consultant, Office of the Chief Executive Officer, NITI Aayog

Vani Rikhy, AVP Business Development & Sales, Euler Motors Pvt. Ltd.
APPENDIX B
Resources Referenced at the Webinar


REFERENCES
