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Ramifications of Indian vehicle scrapping policy across the mobility sector

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Mitigation of greenhouse gas (GHG) emissions and other environmental impacts associated with the provision of mobility services requires unprecedented global technology and policy interventions. Fuel efficiency and vehicle fleet renewal have recently been the focus of many governments through vehicle scrapping policies (VSPs) due to the emissions burdens of older vehicles, which are generally less efficient and more reliant on fossil fuels. In a similar push for domestic manufacturing and fleet modernization, the Indian Ministry of Road Transport and Highways has announced their intent to introduce VSP, beginning with the draft ‘Motor Vehicles (Registration and Functions of Vehicle Scrapping Facility) Rules, 2021’. These rules, planned for phased implementation starting October 2021, will require deregistration of private vehicles older than 20 years and commercial vehicles older than 15 years if they fail mandatory fitness tests. This policy would affect ~21 million on-road end-of-life vehicles (ELVs), including 1.7 million commercial goods/passenger vehicles. Based on our own estimates, the current fleet of ELVs will eventually generate over 9 Mt steel scrap, ~1 Mt aluminum scrap, and ~3 Mt other materials like plastics, glass, and rubber. Thus, VSP has significant potential to advance the circular economy and reduce GHG emissions in India. This policy brings in much-awaited regulation for ELVs management but faces several local challenges due to the nature of mobility services in India and continuing devastating socioeconomic impacts of the COVID-19 pandemic.

A policy like VSP is crucial to progress towards circular resource management and emissions reduction in the transportation sector globally, given India’s important emerging role in vehicle manufacturing and use. India’s increasingly affluent middle-class population, currently low per
capita vehicle population, and growing energy demand (IEA, 2021) indicate that vehicle use may increase enormously in the next decades, continuing existing trends (Rao et al., 2019). Issues such as transport related air pollution and road congestion are already notable challenges for Indian society.

The older vehicle fleet remains a bigger cause of concern due to inefficiencies, safety and pollution. About half of India’s vehicular emissions today come from pre-2005 vehicles, mainly from diesel-fueled heavy duty vehicles. Given the technology standards used in older vehicles, particulate and gaseous emissions can be drastically reduced with fleet modernization. It is however important to note that voluntary scrappage policies and fleet renewal programs have not always resulted in significant emission reductions (Kagawa et al., 2013), because of the considerable lifecycle emissions associated with manufacturing, longer distances traveled by new vehicles and their improved technical performance. Further, the vehicle age for scrapping policy should not be arbitrary because emissions savings depend on vehicle fleet type and additional lifecycle parameters including technology, driving patterns (Kagawa et al., 2013).

From a resource perspective, VSP will have extraordinary ramifications across the whole vehicle lifecycle including design, operation, end-of-life as well as consumer preferences, vehicle adoption rates, and scrapping infrastructure. Evidence suggests that efforts on material efficiency across vehicle lifecycle will lead to significant GHG emissions savings in India (Hertwich et al., 2020). The Indian Automotive Industrial Standard-129 (AIS 129), aimed at promoting material recovery considerations in early design, will likely contribute in the future. However, there are presently no mandatory policies to either measure or achieve greater material efficiency. Thus, coverage of the whole lifecycle with appropriately aligned policy interventions remains necessary.

To effectively contribute to India’s material efficiency and net-zero efforts, VSP requires massive infrastructure development and data-driven impact assessments to ascertain effectiveness. From a manufacturing perspective, few Indian states are home to almost all domestic automobile production sites but the vehicle registration and eventual ELVs are spread all across India. Vehicle ownership and distribution across cities and hinterland are complex issues. The infrastructure required for scrappage needs to cover all 640+ Indian districts, thus necessitating massive financial and land requirements. The Indian government expects private investment of INR 10000 Crores (US$1.36 billion) for new vehicle scrapping facilities. Even though some automobile manufacturers in India have shown an inclination to open such facilities, it is unlikely that they will cover all districts. The provisions within the policy do not mandate manufacturers to either invest in scrapping or take-back old vehicles, effectively keeping them out of extended producer responsibilities. The political nature of land allocation and financial burden for state governments will cause further logistical hurdles.

Given the dominance of the informal (i.e. unorganized) sector in remanufacturing and vehicle scrap management, efforts on its formalization through VSP face tough behavioral challenges.
Most of the commercial vehicles in India are owned and driven by individuals who depend on them for income. In light of the devastating socioeconomic impacts of COVID-19 in India, implementation of VSP would face many hurdles. Currently, there are no funds and/or contributions from the federal government for promotion of vehicle scrapping. This is contrary to financial packages linked with fleet renewal and scrapping efforts in countries such as Germany, US, and Japan. Lack of federal financial support means that old vehicle owners would have to rely primarily on scrap values, with limited roles of state road tax rebates, registration fee discounts and discretionary discounts from new vehicle manufacturers. The proposed incentive structure brings insufficient financial benefit for vehicle owners and is thus unlikely to persuade owners for scraping vehicles. The flourishing informal vehicle reuse market in India provides higher value for old vehicles than scrap. Uneven enforcement of the policy across different states will likely cause further promotion of informal reuse markets for ELVs without mandatory performance tests, limiting the effectiveness of VSP.

It is yet unclear if all existing and forthcoming vehicle types will fall under the scope of VSP. With ongoing informal sector manufacturing of small electric vehicles and greater penetration of advanced electric and hybrid vehicles, contemporary vehicle policy must include plans for their safe scrappage. Given the traditional e-waste challenges, growing concerns around electric vehicle battery waste must be addressed. The provisions of formalizing scrappage yards would bring improvements in resource recovery rates and lower occupational hazards. However, capacity building programs for the informal facility workers to explicitly include them in planning and management of formal scrappage sites are crucial.

Given numerous challenges ahead, the wider research community can play a significant role in examining key issues around low carbon mobility future, including:

- Empirical exploration of the ‘appropriate vehicle age’ for VSP
- Enhanced understanding of vehicle reuse and remanufacturing networks
- Behavioral preferences of vehicle owners in adoption of lower environmental impact alternates
- Creating a geo-referenced dynamic vehicle database with age, engine, technology etc.
- Role of design and manufacturing stakeholders in ELVs management
- Prospects of vehicle take back and/or scrappage handling by automobile manufacturers
- Life cycle assessments for vehicle life-time extension, engine upgrades, maintenance
- Challenges in end-to-end recycling of ELVs and technological innovation priorities
- Options for vehicular hazardous waste handling (e.g. refrigerants, batteries)
- Investigating systemic issues around demand, adoption and impacts of electric vehicles and public transport investments.

Overall, the proposed VSP remains a key intervention for material circularity and emissions reduction. Introducing strict vehicle emissions standards and improved public transport infrastructure should remain the next priorities. Given the demographic differences and uneven
pace of infrastructural development across India, personal vehicles will remain popular and thus better management of ELVs will help in reducing environmental pollution and transitioning to a more circular economy.

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