NITI Aayog

Confederation of Indian Industry

CII–NITI Aayog's **'Cleaner Air Better Life Initiative'**

ACTION PLAN FOR CLEAN TRANSPORTATION

Report of the **Task Force on Clean Transportation**

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MESSAGE

Formulation of appropriate strategies for maintaining a clean, green and healthy environment is a priority in NITI Aayog. We are all aware that air pollution is a major threat to a healthy environment. For controlling air pollution, NITI Aayog has been working closely with Confederation of Indian Industry (CII) and other stakeholders. On the World Environment Day (5th June, 2017), NITI Aayog and CII organized the first meeting of their joint initiative "Cleaner Air Better Life" with an objective to address the issue of air pollution in the Country with active participation of the Government agencies, the industries and other stakeholders.

Subsequently, four Task Forces were constituted in NITI Aayog with experts as members to recommend suitable interventions for Clean Fuel, Clean Transport, Clean Industries and Biomass Management. Seven areas of action, identified by the Task Force on Clean Transportation through a consultative process, would be highly useful for mitigation of air pollution. Movement from increased use of private vehicles towards sustainable means of transportation such as public and shared transportation is needed for controlling air pollution particularly in the urban areas.

I congratulate CII team for their excellent work on the "Cleaner Air Better Life" Initiative. I would also like to congratulate Mr. Abhay Damle, Joint Secretary, MoRTH and Convenor of the Task Force on Clean Transport, for showing great leadership while undertaking extensive consultations with the stakeholders and coming up with specific recommendations. I would also like to place on record appreciation for Mr. Yaduvendra Mathur, Mr. Jitendra Kumar, Ms. Pratima Gupta and other officers of the NRE Vertical, NITI Aayog for providing necessary support and relevant inputs to the Task Force.

(Amitabh Kant)

Place- New Delhi

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Message

Rapid urbanisation and rise in the living standards has led to preference for personal mobility over last decade. As the Government is introducing Mass Rapid Transit Systems to cater to mobility needs in some of the major cities, there is a greater need for integrated public mobility system and improving reliability of services in order to shift citizens from personal vehicles to public transport.

Under source apportionment study of IIT-Kanpur, vehicular emissions have been identified as one of the sources of air pollution in Delhi. Rapid growth in private vehicles and declining fleet of public buses in last few decades has worsened the road traffic and air quality. Hence efficient and reliable public transportation services are essential for decongesting roads and cleaning Delhi's air. Under the CII-NITI Aayog cleaner air better life initiative, this task force on Clean Transportation has recommended scaling of public bus fleet by involving private sector, increasing reliability of intra-city operations and improved pedestrian facilities for last mile connectivity to metro and bus.

Long-term restructuring of the transportation sector is imperative to mainstream mobility paradigm and prioritise sustainable modes of transportation such as public, shared and non-motorised modes of transportation in the city. Medium to heavy commercial vehicles such as buses, trucks etc. which ply more frequently on road, are at heart of most recommendations due to their higher contribution to vehicular emissions which is validated from several studies. In this regard, the Central Government is already deliberating a scrapping policy for old commercial vehicles which would pave a way for cleaner vehicular fleet with latest emission controls.

I would like to thank CII and NITI Aayog for the opportunity to lead the consultations under the Task force on Clean Transportation. I am hopeful that concerned stakeholder will find these recommendations helpful for prioritising action to reduce vehicular emissions across Delhi NCR.

(Abhay Damle)

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1. BACKGROUND

Personal and freight mobility are important aspects of economic development and therefore create a significant footprint on the natural environment, especially on the ambient air quality. Vehicular emissions have been identified as one of the sources of air pollutants, specially PM 2.5, as per source apportionment study of IIT-Kanpur commissioned by Government of NCT of Delhi in the year 2015 (Sharma and Dikshit, 2016). Although there are other contributors to air pollution but the vehicular pollution remains a major non-point source. Efforts are needed for reducing the overall impact of the same. Another distinguishing feature of Delhi's transportation system is the medium and heavy commercial vehicles (MHCVs) which are 2.5% of the total vehicular population but are responsible for over 65% of the total vehicular pollution as well as fuel consumption.

Under CII-NITI Aayog 'Cleaner Air Better Life Initiative', the task force on clean transportation has undertaken a consultative process to identify seven areas of action towards mitigation of air pollution in Delhi and National Capital Region (NCR). To begin with, it proposes mobility reforms to induce a more fundamental change from private vehicle towards sustainable means of transportation such as public and shared transportation. Further, limiting high-mileage polluting vehicles, strengthening Pollution-Under-Control (PUC) regime, allowing retailing of bio-fuels, promoting electric-mobility, decongesting traffic hotspots and retrofitting solutions are recommended by the task force, as elaborated below. Detailed action plan listing all the action points, timelines and implementation agencies is presented in Table 2.

2. INCLUSIVE APPROACH OF THE INITIATIVE

Air-shed is a common geographical area where prevalent topographical and meteorological conditions limit dispersion of pollutants, thereby necessitating an overall strategy for management of air quality. Annual average reduction ranging from 55 to 74% (PM10) would be required across all NCR cities to meet the national air-quality standards (EPCA 2017). Therefore, an integrated approach and highly coordinated action is required from concerned stakeholders within the air-shed.

The 'Cleaner Air Better Life Initiative' aims towards:

- Developing an integrated approach to address key sources of air pollution
- Bringing policymakers, industry, academia and civil society organisations on one common platform for building consensus on clean air action
- Getting buy-ins from diverse stakeholders for voluntary commitments and course-correction for cleaner air
- Influencing policy change for cleaner air and promoting sustainable business models that address air pollution

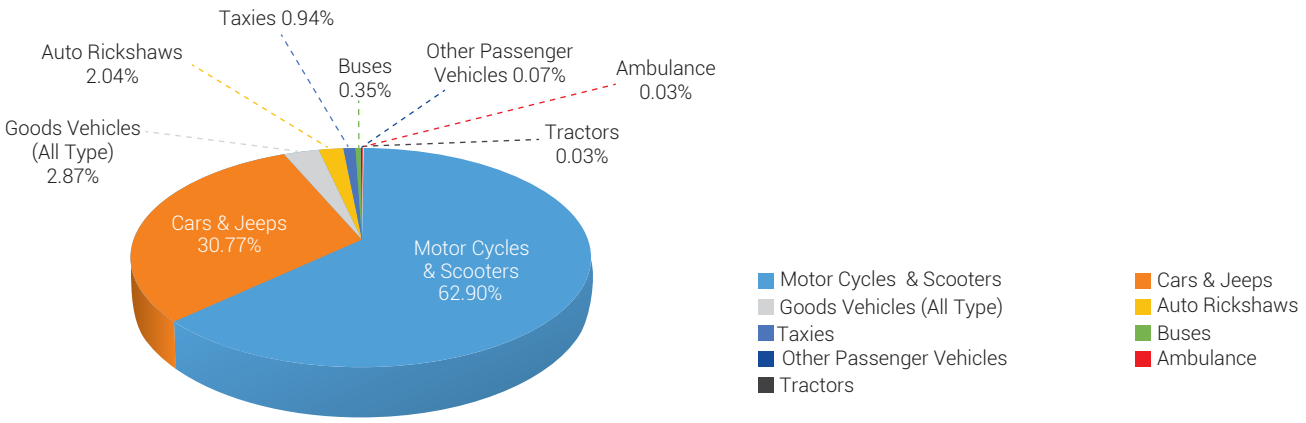
The task force on clean transportation has adopted the structured approach in identifying possible solutions to vehicular emissions which is a major source of air pollution in Delhi-NCR. The full list of stakeholders consulted by the task force can be found in Annexure 1 of the Report.

3. RECOMMENDED ACTION PLAN

3.1 Reform Public Transport and Shared Mobility

There has been a tremendous growth in private motor vehicles in India at the expense of public and shared modes of transportation. As per the *Economic Survey of Delhi 2016-2017* (GNCTD 2017), the intra-city bus fleet in the city increased from 3,469 in the year 2005-06 to merely 4,352 in the year 2015-16. In addition, there were 1,490 cluster buses operational in the year 2015-16. Taxis in the same period increased five times from 0.02 million to 0.1 million. However, during the same period number of private passenger vehicles grew from 1.47 million passenger cars and 3.1 million two-wheelers to 2.9 million passenger cars and 6.1 million two-wheelers, respectively. The private-cars, two- wheelers, three-wheelers, taxis, buses and goods vehicles in Delhi represent 31%, 63%, 2%, 1%, 0.35% and 3%, respectively, of all the vehicles on the road (see Figure 1 for more details). Public and shared modes of transportation need to be scaled up to ensure long-term behavioural change in favour of public transportation. It has been estimated that buses, which constituted barely 1.2 % of the total number of vehicles in 2005-06, catered to around 60% of the total travel demand. On the other hand, personal vehicles such as cars and scooters, representing almost 93% of the total number of vehicles, catered to only 30% of the total travel demand (DDA 2007). Mass transit options such as metro and intra-city buses help decongesting roads as they occupy lesser road space for the same number of passengers transported and their energy consumption per passenger-km (pkm) is significantly lower.[1] Currently, an ecosystem[2] is lacking to ensure last mile connectivity and safety of the end-user between bus-stop or metro-station and destined location. Hence, enhancing pedestrian facilities forms an integral part of mobility reforms. Availability, accessibility, affordability and cleanliness serve as guiding principles towards these reforms. These reforms require following actions from relevant stakeholders.

Figure 1. Share of different types of vehicles in road transport in Delhi



Source: Adapted from GNCT 2017

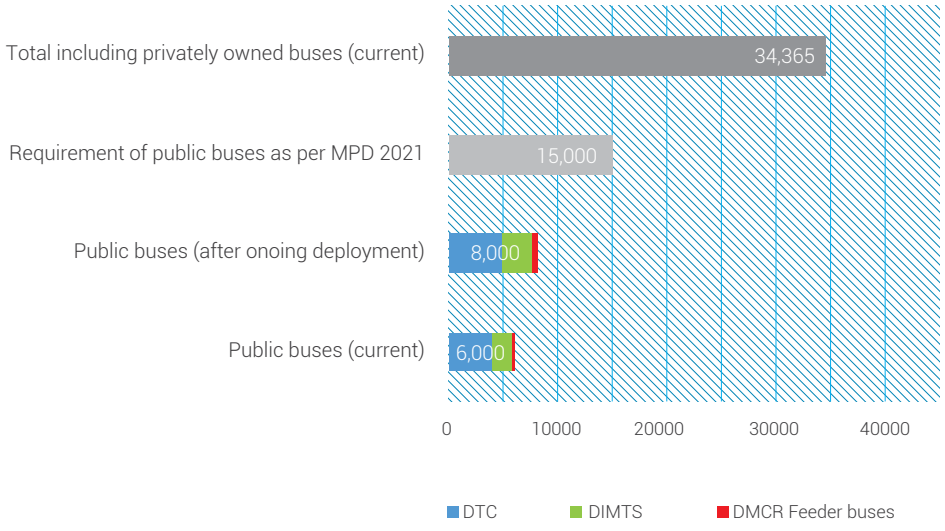
[1] 86.4 kJ/pkm for Delhi-metro, 215 kJ/pkm for BRTS AC-bus and 1,870-2,343 kJ/pkm for passenger cars.

[2] Currently many issues are faced by pedestrians such as: lack of infrastructure for walking/ cycling including dedicated traffic signals, 2-Wheelers using walkways and bike lanes during congestion compromising safety of pedestrians, and illegal parking.

Although the STU-run buses have not grown in the city, data shows that the buses as a whole (including contract carriages and privately-owned buses) have recently grown from 19,729 in 2014-15 to 34,365 in 2015-16.

Delhi Transport Corporation (DTC) is world's largest fleet of eco-friendly CNG buses. Combined with buses under cluster model, total number of buses under stage carriages in Delhi amount to roughly 6,000 and Delhi government has plans for 1,000 more buses under each operator (DTC and DIMTS) in 2017-18 (GNCTD 2017b). For last mile connectivity, 517 mini buses are planned to be deployed on 93 Delhi Metro feeder routes, out of which 219 buses are plying on 43 routes (DMRC 2018). The stage carriage buses in Delhi, except cluster buses, have declined in the past. As seen in Figure 3, similar situation prevails across cities in India. Delhi would need 15,000 buses in 2021 in order to meet the demand of population (DDA 2007). Although the State Transport Undertakings (STU)-run buses have not grown in the city, data shows that the buses as a whole (including contract carriages and privately-owned buses) have recently grown from 19,729 in 2014-15 to 34,365 in 2015-16 (GNCTD 2017).[3] The private players, therefore, present a significant opportunity in scaling the intra-city bus operations in the city (see Figure 2). The recommended actions by task force, in line with these findings, are outlined below.

Figure 2. Existing public and private-owned buses in Delhi



Source: Based on GNCTD (2017), DIMTS (2018), DMRC (2018)

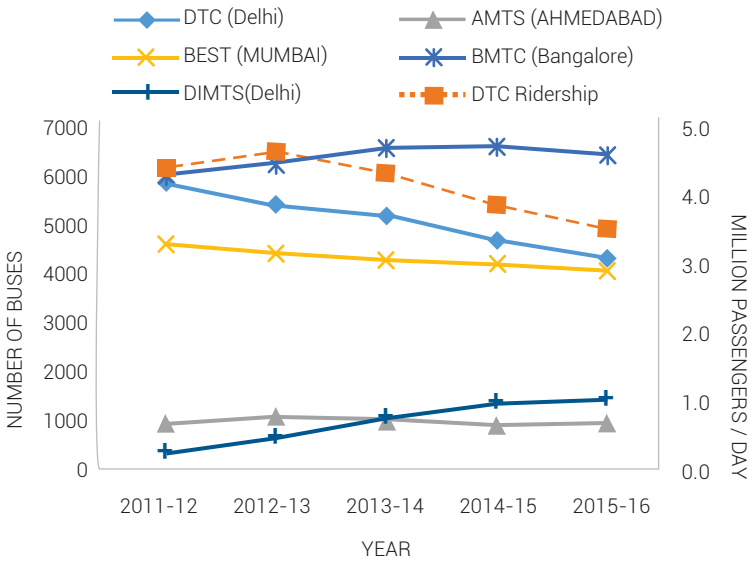
[3] Although time-series data would be required in ascertaining the claim.

Public transportation options should be accessible within **500 metres** for a household in urban areas and within **1,000 metres** for peri-urban areas.

a) Improve Availability and Accessibility of Public and Shared Transportation Services

i. **Identify gaps:** It is recommended that public transportation options should be accessible within 500 metres for a household in urban areas and within 1,000 metres for peri-urban areas. Apart from the accessibility criterion, the population-to-bus ratio and number of inter-modal exchange terminals can be considered for planning the bus fleets. State Transport Undertakings (STUs) may undertake needs assessment to identify these gaps. Density of urban settlements is an important parameter for planning frequency of buses on specific routes.

Figure 3. STU bus fleets across selected million-plus cities in India



Source: Based on GNCTD 2017, GoI 2017 and DIMTS 2018

> There is a need of cohesion between central government and state government regulations to make sure that bus aggregator services and STUs co-exist synergistically.

ii. **Involve private-players or entrepreneurs:** STUs may improve vehicular fleets based on the identified gaps as above by involving entrepreneurs. This will enable STUs to resolve their financial constraints. It requires liberalizing the permit system for intra-city buses, and an entrepreneurship model which should provide guidance to private players on passenger safety and quality of services.

In addition to this core recommendation, there are two existing models for intra-city buses operational in Delhi and may be leveraged in increasing city bus fleets.

- **Cluster bus:** These buses in Delhi are operated by Delhi Integrated Multi-Modal Transit System (DIMTS) Ltd. DIMTS is an equal equity joint venture between Government of National Capital Territory of Delhi (GNCTD) and the IDFC foundation. Under Delhi government's scheme: Corporatisation of the private stage-carriage buses, nearly 1,700 cluster buses are currently operational in the capital. As clear from the recent development in fleet sizes of various STUs vis-à-vis cluster operator (see Figure 3), only the later has been able to sustain and expand intra-city operations consistently. Department of Transport, GNCTD acknowledges that average higher earning of cluster buses, by 10-15%, compared to DTC buses on same routes is attributable to advanced monitoring using information technology. This situation presents an opportunity for peer-to-peer learning among stage carriage operators, and cluster bus model could be leveraged across Delhi-NCR to provide public services under the public-private partnership. Department of Transport, GNCTD has, in fact, authorised DIMTS for 1,000 new cluster buses in January 2018. (GNCTD 2017b; DIMTS 2018).
- **Bus aggregators:** The point-to-point bus aggregation services based on App are currently offered in metro cities like Bengaluru, Hyderabad, Mumbai, Delhi, and Gurgaon (where these services thrive in absence of intra-city bus system).

  Aggregation platforms tie up with private bus owners to provide point-to-point mobility services connecting residential areas with major business or technology parks, where demand for such services exists.

  It has been found that lack of clarity on regulation is a major issue with service aggregators. At the time of writing this Report, there is no certainty on implementation of proposed scheme: App-based premium buses in Delhi (GNCTD 2016), by Government of Delhi. The notified scheme acknowledged the role of bus aggregators in reducing congestions and air pollution. Similarly, amendments of 2017 in Motor Vehicle Act (1988) acknowledge bus service aggregators but it is optional for states to follow the central government guidelines.

  The lack of clarity in the regulation[4] has been a prime reason for aggregator services been deemed illegal on the grounds of violating monopoly of STUs over stage carriages (WRI 2017). Bus aggregator model have flourished across cities despite regulatory bottlenecks. The potential of aggregators to shift non-captive users from private vehicles to shared buses needs to be tapped. For this, there is a need of cohesion between central government and state government regulations to ensure that bus aggregator services and STUs co-exist synergistically.

iii. **Liberalise taxi permits:** Taxi permits may be liberalised so that private cars can easily be converted and used as taxis by service aggregators. However, the limited number of aggregator services available in the market today could lead to an oligopoly market. Passenger safety is another major concern under the liberalized taxi permit regime. These concerns need to be addressed through policy dialogue with all concerned stakeholders.

[4] Inherently as a result of the way stage and contract carriages are defined under the Motor Vehicle Act, 1988.

For **improved reliability** of intra-city buses, passengers should be able to track the timings and arrivals in real-time. Collection of real-time data also enables monitoring of bus fleet for efficient operation.

b) Change Public Perception towards Public Transportation Services

i. **Improve reliability of intra-city bus services:** Improving reliability of intra-city bus services is extremely important for efficient utilisation of available resources and changing the public perception towards public-transportation. Passengers should be able to track the timings and arrivals of buses at all terminals in real-time. Collection of real-time data also enables monitoring of bus fleet for efficient operation.

ii. **Improve quality of services:** Raise the quality of services for intra-city bus operations. Set comprehensive benchmarks[5] and guidelines for enhancing quality of services including bus condition, passenger safety and cleanliness.

iii. **Reduce overcrowding:** Reduce over-crowding in intra-city buses. Planning authorities should take note of population growth versus number of buses to identify gaps and follow international benchmarks.

iv. **Develop intermodal exchange terminals:** Integrate different modes of public transportation including the city bus system, metro and suburban railways. Focus of integration should be on developing interchange terminals among these modes which is presently not a priority of urban planning and development processes.

v. **Integrated information system with real-time updates:** Introduce an App for integrated public transport information on buses, metros and suburban rail.

vi. **Devise monitoring system:** Devise mechanism for regular monitoring of quality of public transportation services including complaint tracking and redressal.

vii. **Promote public transport:** The use of public transport, for specified number of days in a week, may be made mandatory for public officials.

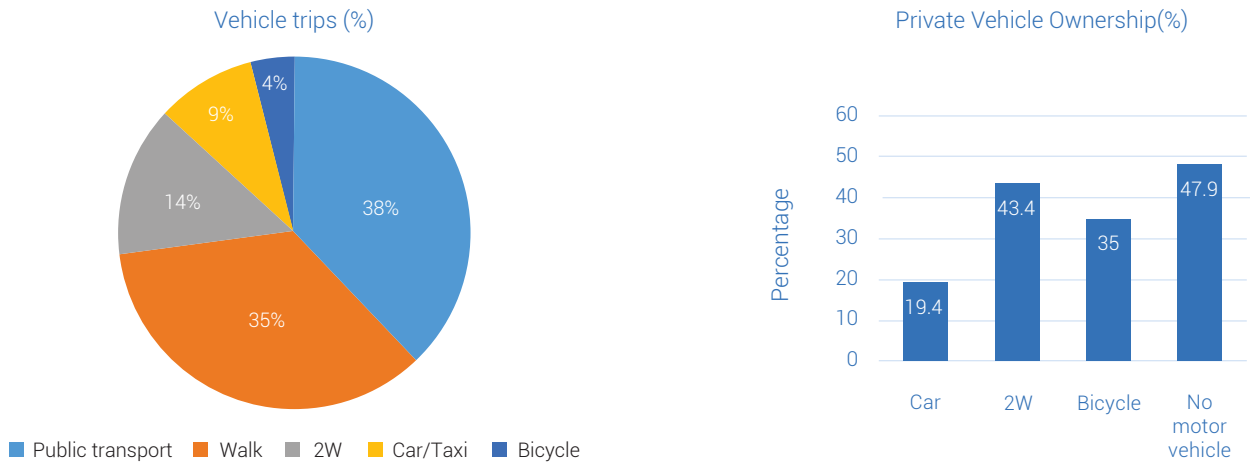
[5] Such as low-floor buses.

Around **35% population** in Delhi owns cycles but only **4.5%** of them actually use cycles for commuting.

c) Pedestrian Facilities

Walking and cycling are important part of urban mobility for sustainably meeting the demand of short-medium trips and providing last mile connectivity to public transport. Almost 60% of the trips in Delhi are less than 4 Km and 80% are below 6 Km which are ideal distances for using non-motorized modes– walking and cycling (MoUD 2016). City lacks safe and secure walkways/cycle lanes in addition to different amenities required for pedestrians/cyclers. Census (2011) data shows (Figure 4) that around 35% population in Delhi owns cycles but only 4.5% actually uses cycles for commuting. Inadequate cycling facilities are pushing the population to move towards motorised private vehicles, thereby causing loss of environment, health and life (MoUD 2016). Nation witnesses 1.5 lakh deaths annually due to road accidents of which 60% are pedestrian and cyclists (MoUD 2016). Overlapping benefits for air quality, road safety and mobility therefore need to be considered while planning new infrastructure. Lack of proper infrastructure is a major hurdle for citizens to adopt a sustainable lifestyle. Unified Traffic and Transportation Infrastructure Planning and Engineering Centre (UTTIPEC) street design guidelines (UTTIPEC 2011) and Street Design Regulation of Master Plan 2021 (DDA 2007) can be followed to ensure equitable share of roads/streets to different modes.

Figure 4. The ownership and share of different modes of passenger mobility in Delhi



Source: Based on Census (2011)

> Parking management is an important tool to limit number of vehicles on the road. It can be done dynamically in order to decongest roads in areas worst affected from air pollution.

I. **Improve/upgrade pedestrian facilities :** All roads need proper pedestrian facilities that are conducive to safe walking and cycling. These include, dedicated signals for walking and cycling, green covers (single-line tree shade for cyclers), road markings, lighting, accessibility to disabled etc.

   Proper storage facilities for bikes can be provided, with extremely low capital and space requirements, by installing stackable cycle parking throughout the city at undersides of flyovers, staircases, foot-over-bridges and similar places in the metro stations. Parking cycles does not require much space and may be offered free of cost at all metro stations.

II. **Sensitise traffic police and driving licensees on the rights of pedestrians:** Sensitisation of traffic police and driving licensees will be required so that while enforcing traffic rules, pedestrians and cyclers are not ignored.

III. **Public participation to increase ownership of pedestrian facilities:** Introduce an app for reporting and tracking of pedestrian/cyclers' issues. This will foster a sense of ownership among pedestrians for enhancing infrastructure.

IV. **Enforcing safe walking/cycling:** Ensure stringent penalties for two /three-wheelers using walkways/cycle lanes during congestion and illegal parking of motor vehicles on spaces reserved for pedestrians/cyclers. Existing penalties are very low and Motor Vehicle Act (including Municipal Act) would require appropriate amendments.

d) Reform Parking Norms

Parking is an important tool for traffic management, that is limiting vehicles on the road. Also, vehicles parked on streets end up encroaching the spaces meant for cyclists and pedestrians.

Parking management can be done dynamically in order to decongest roads and automatically reduce loading of vehicular emissions in areas worst affected from pollution.

i. **Levy fee for parking on road:** Introduce on-road parking fees based on the area and time to decongest prime streets and incentivise public transport in areas with adequate supply for public transport services, for instance, the metro stations.

   As per the Households and Metro-users Survey by Department of Transport GNCTD, 45% of car users are likely to shift to public transport if the parking fees is hiked by 50%[6] (MoUD 2016). Land is a scarce resource and is under pressure from various economic activities in the city. Effective parking fees can be designed considering following elements:

   - **Land value:** Parking fee in commensurate with the land value or land opportunity cost. Additionally, it should be able to recover the capital and operational & maintenance (O&M) costs for parking.
   - **On-road versus off-road:** Higher parking fee for on-road parking compared to off-road, in order to increase utilisation of the off-road parking infrastructure. The High Powered Committee on Decongesting Traffic in Delhi suggests that it should at least be 3-5 times higher than off-road parking fee (MoUD 2016).
   - **Area and traffic density:** Existing land use and traffic densities are important parameters in deciding parking fee. Following two elements may be considered for area based parking-
   - Higher fee for on-road parking on the prime commercial streets and relatively lower fees for on-road parking in peripheral areas, thus providing incentives/disincentives in favour of reduced traffic congestion.

[6] In addition, to hike in parking fee, survey results suggest that reduction in travel time, availability of quality feeder services are important for enabling shift to public transportation. Most respondents need good comfort and frequency for shifting to public transport.

> MoRTH commissioned study identifies that the medium and heavy commercial vehicles although **2.5%** of the total vehicular population are responsible for over **65%** of the total vehicular pollution as well as fuel consumption.

- Higher parking fee in areas with adequate availability of public transport services, for instance, the metro stations. Non-motorised vehicles, Intermediate public transport modes (auto rickshaw, taxi etc.) and feeder services may receive preferential treatment and may be incentivised in these areas.

- **Time:** Parking fees based on the temporal demand for parking. Real-time congestions charges may be considered based on traffic, size of vehicle and time of the day.

- **Shared parking:** Optimal space utilisation may be ensured in coordination with RWAs, encouraging shared or common parking facilities for residents.

- **Institutional arrangements:** Implementation involves multiple civic agencies. A unified metropolitan transport authority may be considered for parking management across city. Parking management can be undertaken on the basis of zones (or parking management districts as per the Delhi Master Plan 2021), clearly demarcating the spaces for on-road/off-road parking in those areas.

ii. **Reserve parking space for shared vehicles:** Allocate 20-30% of public parking spaces for shared vehicles.

3.2 Limit the High-mileage Polluting Vehicles on the Road

The vehicular pollution from high-mileage commercial vehicles which frequently ply on the roads is a major concern. MoRTH commissioned study identifies that the MHCVs, comprising 2.5% of the total vehicular population, are responsible for over 65% of the total vehicular pollution as well as fuel consumption (MoRTH, 2017). This is especially relevant for such vehicles using older BS regime. How exactly vehicles on the road would be identified for non-compliance is a significant operational challenge. Appropriate information tools will be required in Hindi and English including hoardings along the roads to implement 'end-of-life vehicle policy'.

> Improving PUC system requires mandating standardised software across centres with real time updates. Centralised system can be extended to Delhi-NCR with real-time linking of PUC (available with NIC) and registration data (Vahan database).

a) End-of-Life Vehicle Policy

Mandate maximum vehicle life, say 20 years, which means that if such measure is implemented in 2020, vehicles manufactured prior to 2000, will be banned. An advance notice can be issued so that businesses have ample of time to make a transition. Traffic police will have powers to lift and scrape non-compliant vehicles.

In addition, the task force suggests that a ban can be imposed on high-mileage vehicles belonging to old BS regimes during peak pollution. High polluting vehicles (old vehicles, BS I, BS II vehicles) can be stopped from plying on roads during peak pollution period, for instance, for three months during winters.

b) Modal Shift in Freight Transportation to Railways

The Roll-on Roll-off (RORO) services enable carrying the loaded truck onto flat railway wagons. These services are already pioneered by Indian Railways (IR) in Konkan region and should be scaled-up to alleviate traffic congestion on roads in Delhi NCR. Although the railway routes in Delhi-NCR and surrounding regions are highly electrified and pose challenge to scaling up these operations in the region; feasibility of scaled up RORO operations needs to be clearly understood. This could be especially relevant for the western line connecting Alwar to Panipat and passing through Rewari, Jhajjar and Rohtak. Also, augmentation in IR's capacity to carry goods in double stack dwarf containers specifically designed for electrified tracks can have direct impact on reducing the number of trucks on road.

Finally, a long-term strategy is required to enable a modal shift from road to railway which could pave way to permanently addressing the pollution arising from goods transportation across National Capital Region.

3.3 Strengthen Pollution-Under-Control Regime

Following measures are required to strengthen existing Pollution-Under-Control (PUC) regime and make it more effective.

a) Strengthen the Existing PUC Regime

I. **Check/calibrate the PUC equipment:** Calibrate equipment deployed for strengthening PUC certification

II. **Standardised software:** Address lack of strong oversight over centres, poor data reporting and fake software by mandating standardised software across centres with real-time updates

III. **Annual PUC checks by linking it to motor insurance:** Link annual vehicle insurance policy with PUC certificate.

IV. **PUC check centres at vehicle service centres:** Set up PUC check centres in Original Equipment Manufacturer (OEM) service centres and link PUC check with vehicle servicing.

Electric vehicles present significant opportunity for improvement of air–quality by shifting the emissions from multiple moving sources in the city to point sources where they can be easily managed.

b) Compliance checks with real-time monitoring

I. **PUC random checks:** Deploy Portable Emission Measurement System (PEMS) for random checks with real-time update of non-compliance data.

II. **Real-time and Centralised PUC:** Link the vehicle registration database (Vahan) with the centralised PUC database (available with NIC).

III. **Extent centralised PUC to Delhi-NCR:** Extend the centralised system to Delhi-NCR with real-time linking of PUC and registration data.

IV. **Citizen helpline:** Set up a helpline where citizens can report visibly polluting vehicles

V. **Enforcement:** Ensure soft enforcement which means that vehicles owners would be let off after a warning but they would be required to acquire the certificate within 7 days.

3.4 Allow Retailing of Bio-ethanol and Bio-diesel

Cleaner fuels, especially bio-ethanol can help reduce PM 2.5 and NOx levels. At present, 2.5% blending of bio-ethanol is being achieved against the target of 10%. For higher blending targets, solution readiness, in terms of flex-fuel vehicles is unknown. Availability of bio-ethanol for blending is very low due to competing uses and lack of dedicated supply chain for bio-ethanol as transportation fuel. Availability of bio-diesel in terms of flex-fuel vehicles is unknown and is perceived to be low. It is thought to be a long-term solution and mapping of supply chain challenges and dedicated implementation models are required for scaling up production of bio-fuels in the country. Task force recommends allowing retailing of bio-fuels. This will require further amendment to The Motor Spirit and High Speed Diesel (Regulation of Supply, Distribution and Prevention of Malpractices) Order, 1998. An amendment was made to the order in 2015 for allowing direct sale of bio-diesel to users such as Indian Railways by manufacturers other than Oil Marketing Companies (OMCs). The competition with food and forests for land-use (except in case of second generation bio-fuels from agricultural waste), restrictions on transporting ethanol across states, challenge of adopting uniform blending across states and flex-fuel vehicle requirements above 10% blending are thought to be major impediments in large-scale adoption of bio-fuels.

3.5 Promote Electric Mobility

a) Eliminate all permit requirements for EV vehicles

Task force proposes eliminating all permit requirements for electric vehicles in order to encourage electric mobility as getting and renewing permits every year is costly and time consuming. It would require a change in existing permit regime, at national and state level. Safety issues will need deliberation such that they do not impede the success of such intervention.

b) EV targets for public/shared-transportation service providers

Electric vehicles present significant opportunity for improving air–quality by shifting the emissions from multiple moving sources (vehicles) in the city to point sources (power plants where emissions can be managed in a cost-effective manner). The interest among STUs for deploying electric bus fleets has been very high. Recently, the department of heavy industry received 47 proposals from 44 cities across 21 states in response to expression of interest inviting proposals

[7] As per 2011 census, there are 53 million-plus cities and urban agglomerations in India out of the total 468 urban agglomerations or towns belonging to class- I.

Depending on the choice of financial model, the burden of risks can be shifted to either operator, lender or

manufacturer of e-bus

from million-plus cities[7] (MoHIPE 2017). Department of Heavy Industry (DHI) received proposals for 3,144 e-buses by STUs in India and it indicates high interest among STUs for replenishing their fleets with electric buses. It has subsequently been decided by the government in December 2017 that eleven cities[8] including Delhi will be provided financial support for 390 e-buses. Supply orders for these e-buses are going to be issued by February 2018 (DHI 2017). Financial support offered under on-going phase (one) of FAME scheme is INR 85 Lakh per e-bus (or 60% of the purchase cost, whichever is lower) on 15% localisation and INR 1 crore per e-bus (or 60% of the purchase cost, whichever is lower) on 35% localisation. Additionally, an amount equivalent to 10% of the total demand incentives can be availed by STUs for setting up charging infrastructure.

Although up-front cost of e-buses is much higher, multiple studies reveal that maintenance cost of e-buses is much lower as compared to CNG or diesel buses. As a result, total cost of ownership (TCO) for e-bus is comparable with low-floor AC buses. The capital cost of electric-bus is 2-3 times higher than conventional diesel buses but operating cost of e-buses is 65% lower (Electric Mobility Alliance 2017). Depending on the choice of financial model, the burden of risks can be shifted to either operator, lender or manufacturer of e-bus. Different financial models are used to procure e-buses. Key features of these financial models, as per the global literature and manufacturers' brochures, are captured in Table 1, including the operator lease model which has been suggested by STUs in India (DHI 2017). Key recommendations of task force for promoting e-mobility are listed below.

Table 1. Key features of financial models for deploying e-bus

S. No.	Financial models	Salient features of financial models
1.	Operator lease model	• Manufacturer assumes operational and technological risks • The financial burden on operator is lowered • The viability gap in terms of 'per km cost' can be paid by the operator
2.	Battery lease model	• Manufacturer assumes risk for technology alone whereas the bus is owned by operator
3.	Capital lease model	• Lender assumes operational and technological risks
4.	Cash/ loan purchase	• Operator assumes operational and technology risks • Bus is owned by operator

[8] 40 buses each for Delhi, Ahmedabad, Bangalore, Jaipur, Mumbai, Lucknow, Hyderabad, Indore and Kolkata (million-plus cities); and 15 each for Jammu and Guwahati (the case of special cities). Apart from 390 e- buses, financial support is being provided for 370 e-taxis and 720 electric three-wheelers in select cities.

A long-term vision for intra-city **electric buses** is required. Retrofitting CNG engines with electric drive trains and pantographs for opportunity charging enroute can be a way forward for electric mobility in Delhi.

I. **EV targets for intra-city buses:** Task force recommends an incremental share of EV at +2% per year for the intra-city public buses keeping in mind the affordability to end-users.

II. **EV targets for system aggregators:** Similarly, realistic targets for service (taxi and bus) aggregators are required. It is important that these targets are not regressive as service aggregators, mainly the taxi aggregators, are already including electric vehicles in their fleet. Similar targets, as recommended for STUs, that is, incremental EV vehicle fleet at +2%/ year can be instituted for system aggregators and may be revised for realistic targets after taking stock of the existing penetration level.

Box 1. Summary of Technological Options for Electric Buses

1. **Trolley buses:** This option may not be feasible in most Indian cities, except for particular locations like Kolkata where the infrastructure for 'tram-cars' exist, or in specific locations, such as in Mumbai where the local administration may find it convenient, given the logistics present there.
2. **BEV Buses carrying on-board energy storage devices:** Two options that may be considered-

   a) Battery provision for a full-day driving range of say 120-200 km (in conjunction with fast charging)

   - Solutions are available and can be deployed in six months to a year.
   - High cost is an inhibiting factor; and the STU's do not see a compelling reason to shift to electric buses, in spite of favorable TCO estimates, considering an operational life of 10 to 15 years for the EV Buses.

   B) On-board battery with 50-75 km range (with a provision for intermittent fast charging enroute, using pantograph at the bus stop-terminal/beginning of the trip)

   - It would cover most bus-trip-lengths in the country adequately with a provision for intermittent fast charging enroute.
   - Clear advantage of lower EV-Bus cost.
   - STUs are more likely to accept it, if the enroute charging infrastructure can be developed.
   - Although this configuration is under trial in several countries, it is a model that is still to be established. Hence, such a project needs to be considered under the FAME India R&D Scheme.

3. **Hybrid-electric (HEV) buses**

   - Sales will be slow to pick-up due to the high cost.
   - Large population of existing diesel and CNG buses could be retrofitted with hybrid-kits by the bus manufacturers in collaboration with technology providers, if needed.

Source: Adapted from minutes of meetings of Project Implementation and Sanctioning Committee (PISC) under FAME India Scheme (DHI 2015 and DHI 2017).

III. **Long–term vision for electric mobility:** A long-term vision for intra-city electric buses is required. Retrofitting CNG engines with electric drive trains and pantographs for opportunity charging enroute (See Box-1 for more details) can be a way forward for electric mobility in Delhi.

Traffic modulation is recommended based on the diversion of traffic in real-time with the help of traffic police

c) Target two- and three-wheelers for large-scale adoption of EV technologies

Two-wheelers and three-wheelers market has a huge potential for adopting EV technologies. Two-wheelers are a major concern for air-pollution; especially for the NOx emissions. They are extremely important for last mile connectivity. Technology availability for these segments is high. Hence, they should be targeted for large scale adoption of EV technologies. Following actions are recommended for this segment, keeping in mind the environmental impacts from large-scale adoption of EVs.

I. **Policy support for a local electric vehicle economy:** Provide policy support to battery operated two- or three-wheelers on priority basis in Delhi NCR. Promote manufacturing of batteries and other parts in India so that country does not become dumping place for cheap batteries manufactured in China.

II. Battery swapping stations may be set up for electric two- or three-wheelers and battery management programmes can be mandated at these stations to curb environmental pollution due to e-waste.

3.6 Decongest Traffic Hotspots

Roads already occupy 21% of the total area of the city (DDA 2007) and no city has been able to build itself out of congestion (World Bank 2014). Local area decongestion plans can help alleviating road traffic at vulnerable points thus improving the overall productivity and reducing air-pollution in the city. Traffic information and stakeholder consultations can be the basis for decongestion planning of local area. High level of co-ordination between local authorities and state government departments, such as Traffic Police, would be required for success. A baseline study is required to identify bottlenecks in road traffic movement. Traffic modulation is recommended based on the diversion of traffic in real-time with the help of traffic police. Introducing area-based and on-road parking fees as discussed under mobility reforms has a great potential to decongest prime commercial streets in the city.

3.7 Retrofitting Solutions

Old vehicles that are non-compliant on road should have an option for retrofitting. Currently there is no clarity on retrofit options available under different vehicle categories. The taskforce therefore recommends appropriate retrofit technologies as and when they are available in the market. Impact of retrofit on vehicle performance/fuel efficiency is important from end-users' perspective. Demand for retrofitting solutions in future will depend upon strengthening PUC norms so that non-compliant vehicles can be identified.

Table 2. Execution Plan for Clean Transportation

Intervention	Action Required	Implementation	Timeline (commencement)	Status
Increase intra-city bus fleet	Needs assessment[1] for strengthening intra-city bus network	DTC, UPSRTC, HRST	March 2018	Intra-city services proposed in Gurgaon
	Guidelines for involving private players	MoRTH, State Transport Ministries/ Departments of Transport	June 2018	Corporatisation of Private Stage Carriage Buses Scheme existing in Delhi (cluster buses) under public-private partnership mode
	Fill gaps by involving private players	DTC, UPSRTC, HRST	June 2018	Aggregators services are in operational under restrictive policy environment.
	Liberalise bus permits (amend Motor Vehicles Act): centre and states	GoI, state governments	June 2018	GNCTD has licensing system for cluster operators
Ensure long-term sustainability of intra-city bus services	Improve reliability: route optimisation and real-time updates	DTC, UPSRTC, HRST, service aggregators	June 2018	
	Set benchmarks for quality of services (including cleanliness) and monitoring mechanism	MoRTH, State Transport Ministries/ Departments of Transport, DTC, UPSRTC, HRST, ULBs in NCR	June 2018	
Integrate public transportation services	Develop inter-modal exchange terminals	DMRC, NMRC, Gurgaon Rapid Metro	March 2020	
	Integrated public information system in NCR[2,3]	DMRC, NMRC, RMGL, DTC, UPSRTC, HRST, DSR, DIMTS	December 2018	
Improve pedestrian facilities	Map pedestrian facilities in NCR- monitoring[4]/tracking system with public participation	ULBs-NCR[5], CPWD, PWD of states, State Transport Departments, Janaagraha[6]	April 2018	
	Sensitise traffic police and driving licensees on rights of pedestrians	Traffic police- Delhi NCT and other NCR regions	April 2018	
	Enforce stringent penalties for 2Ws using walk-ways and bike-lanes during congestion and 4Ws encroaching pedestrian spaces for parking	Traffic police- Delhi NCT and other NCR regions	Immediate	

Table 2. Execution Plan for Clean Transportation

Intervention	Action Required	Implementation	Timeline (commencement)	Status
Promote shared transportation services	Liberalise taxi permits to allow smooth conversion of private cars to taxis- centre and state permits	GoI, state governments	April 2018	
	Parking reforms: Allocate 20-30% of public and corporate parking spaces for taxis and other shared cars	Local bodies/ state governments	June 2018	
Decongest traffic hotspots	Introduce area-based on-road parking fee	ULBs-NCR, Traffic police-NCR, GNCTD and other state governments	April 2018	Draft policy proposed NCT Delhi by GNCTD in Jun 2017
	Baseline study and traffic modulation	MoRTH, State Transport Ministries/ Departments of Transport, ULBs-NCR, Traffic police- NCR	April 2018	Decongestion study undertaken by MoUD (GoI) in 2016; Intelligent Traffic Management System (ITMS) is under implementation as per the Traffic police, Delhi
Limit high-mileage polluting vehicles on the road	End-of-life policy for high mileage vehicles segment	GoI, State Governments	March 2018	Vehicle scrapping policy is under deliberation with the Union Government
	Empower traffic police to lift and scrape old vehicles	Traffic police- NCT and others in NCR	April 2018	
	Scale-up RORO operations in NCR	IR, MoRTH, Road Transport Ministries/ Departments of Transport	October 2018	
Strengthen PUC regime with monitoring across NCR	Strengthen PUC centres with calibrated equipment, standardised software and real-time data	MoRTH, State Transport Ministries/ Departments of Transport	April 2018	
	Centralised system: Link PUC database (available with NIC) with registration (Vahan) database	MoRTH, state government	April 2018	Databases available with MoRTH
	Extend centralised system to NCR: Create PUC database for other NCR regions (State Transport Departments) and link it to centralised system for NCR	MoRTH, State Transport Ministries/ Departments of Transport	September 2018	States not maintaining PUC databases
	Introduce random compliance check vans	State Transport Ministries/ Departments of Transport	June 2018	

Table 2. Execution Plan for Clean Transportation

Intervention	Action Required	Implementation	Timeline (commencement)	Status
	Setup a helpline where citizens can report visibly polluting vehicles	State Transport Ministries/ Departments of Transport, Traffic police- NCR	March 2018	
	Ensure soft enforcement: polluting vehicles' owners would be let off with a warning and would be required to acquire PUC certificate within 7 days.	MoRTH, State Transport Ministries/ Departments of Transport, Traffic police- NCR	April 2018	
Promote electric mobility	Eliminate all permit requirements for EVs (amend Motor Vehicles Act): centre and states	Government of India, state governments	January 2018	
	Mandate incremental target of 2% EV per year for the intra-city public buses keeping in mind affordability to end-users	State Transport Ministries/ Departments of Transport, DTC, UPSRTC, HRST, DHI/ MoHIPE	January 2020	
	Set incremental target of 2% EV for service-aggregators	State Transport Ministries/ Departments of Transport, DHI/ MoHIPE	January 2019	
	Mandate an incremental target of 2% EVs for manufacturing by OEMs	MoRTH	January 2020	
	Long-term vision for intra-city electric buses-with retrofitted electric drive trains and opportunity charging.	MoRTH, State Transport Ministries/ Departments of Transport, DHI/ MoHIPE	June 2018	
	Policy support for local manufacturing of battery based 2-Ws and 3-Ws	DHI/ MoHIPE, MoRTH, State Transport Ministries/ Departments of Transport	April 2018	

Notes:

1. Based on the intermodal exchange points, population/buses ratio and accessibility parameters.
2. Inter-operable transportation data to be shared by these agencies and a protocol needs to be established where an institution needs to be assigned the role of information aggregator.
3. Timeframe to include these IT upgrade at central monitoring facilities of intra-city services, cost of upgrades, sources of funding and capacity/training required to operate the system, requires consultation with respective STUs.
4. Assessment of capacity within the STUs and the ULBs in NCR for monitoring is required
5. Urban local bodies(ULBs) in NCR including NDMC (council), DCB, N-DMC, EDMC, SDMC, Noida, Gurugram, Faridabad and Ghaziabad
6. Their capacity to provide such platforms (e.g. Swachcha Bharat App) can be utilised (suggestive).

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ANNEXURE

Annexure 1

List of Stakeholders Consulted by Task Force

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List of Stakeholders Consulted by Task Force

S. No.	Stakeholder's name	Organisation
1.	Abhay Damle	Ministry of Road Transport and Highways
2.	Gargi Jain	Ministry of Road Transport and Highways
3.	Palavi	Ministry of Road Transport and Highways
4.	Vishnu Mathur	Society of Indian Automobile Manufacturers
5.	K. K. Gandhi	Society of Indian Automobile Manufacturers
6.	Meetu Puri	Central Pollution Control Board
7.	Garima Sharma	Central Pollution Control Board
8.	Vikram Gulati	Toyota Motors
9.	Ashish Aggarwal	Cummins India
10.	Anuradha Ganesh	Cummins India
11.	Harsh Doshi	Cummins India
12.	Ruchi Dhoreliya	Cummins India
13.	Khagender	Cummins India
14.	Geetam Tiwari	Indian Institute of Technology, Delhi
15.	Tom Mathew	Indian Institute of Technology, Bombay
16.	Seema Arora	Confederation of Indian Industry
17.	Sachin Joshi	Confederation of Indian Industry
18.	Kamal Sharma	Confederation of Indian Industry
19.	Mohit Sharma	Confederation of Indian Industry

Confederation of Indian Industry

The Confederation of Indian Industry (CII) works to create and sustain an environment conducive to the development of India, partnering industry, Government, and civil society, through advisory and consultative processes.

CII is a non-government, not-for-profit, industry-led and industry-managed organization, playing a proactive role in India's development process. Founded in 1895, India's premier business association has over 8,500 members, from the private as well as public sectors, including SMEs and MNCs, and an indirect membership of over 200,000 enterprises from around 265 national and regional sectoral industry bodies.

CII charts change by working closely with Government on policy issues, interfacing with thought leaders, and enhancing efficiency, competitiveness and business opportunities for industry through a range of specialized services and strategic global linkages. It also provides a platform for consensus-building and networking on key issues.

Extending its agenda beyond business, CII assists industry to identify and execute corporate citizenship programmes. Partnerships with civil society organizations carry forward corporate initiatives for integrated and inclusive development across diverse domains including affirmative action, healthcare, education, livelihood, diversity management, skill development, empowerment of women, and water, to name a few.

As a developmental institution working towards India's overall growth with a special focus on India@75 in 2022, the CII theme for 2017-18, **India@75: Inclusive. Ahead. Responsible** emphasizes Industry's role in partnering Government to accelerate India's growth and development. The focus will be on key enablers such as job creation; skill development and training; affirmative action; women parity; new models of development; sustainability; corporate social responsibility, governance and transparency.

With 67 offices, including 9 Centres of Excellence, in India, and 11 overseas offices in Australia, Bahrain, China, Egypt, France, Germany, Iran, Singapore, South Africa, UK, and USA, as well as institutional partnerships with 355 counterpart organizations in 126 countries, CII serves as a reference point for Indian industry and the international business community.

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CESD leverages its role of all-inclusive ecosystem player, partnering industry, government, and civil society. It has been a pioneer of environment management systems, biodiversity mapping, sustainability reporting, integrated reporting, and social & natural capital valuation in India, thus upgrading business in India to sustainable competitiveness.

With three locations in India, CESD operates across the country and has also been active in parts of South and South East Asia, Middle East, and Africa. It has held institutional partnerships and memberships of the United Nations Global Compact, Global Reporting Initiative, International Integrated Reporting Council, Carbon Disclosure Project, development agencies of Canada, the USA, the UK, and Germany.

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