# New Delhi in 2030

Envisioning 1.5-Degree Lifestyles

Copyright © 2021 Institute for Global Environmental Strategies





#### Acknowledgements

This report is part of the 'Envisioning Future Low-Carbon Lifestyles and Transitioning Instruments' project, 2019-2021. This demonstration project is implemented under the Sustainable Lifestyles and Education Programme of the United Nations' One-Planet Network, funded by the Government of Japan through its contribution to the 10YFP Trust Fund administered by the United Nations Environment Programme (UNEP). The project is led by the Institute for Global Environmental Strategies (IGES), Japan. IGES administered a call for partners among the MAC (Multistakeholder Advisory Committee) and partners of the Sustainable Lifestyles and Education Programme of the UN One Planet Network and identified the following project partners. Cities were selected in consultation with partner organizations.

### **Project Implementation Partners** (Listed in alphabetical order)

Akatu Institute, Brazil Chulalongkorn University, Thailand ICLEI Africa, South Africa Swechha, India

#### **Communications and Outreach Partners**

Hot or Cool Institute, Germany ICLEI Japan Science Communication and Research Institute (SCRI), Japan

#### **Advisory Partners**

D-mat, Finland National Institute for Environmental Studies (NIES), Japan

Special thanks to ICLEI World Secretariat for providing a platform to share the initial findings of this report

#### Coordinating Author(s)

Satoshi Kojima (IGES) and Aditi Khodke (IGES)

#### Authors

Vimlendu Kumar Jha (Swechha); Ashim Bery (Swechha); Kuldip Singh Sangwan (BITS Pilani); Kailash Choudhary (IIM Shillong)

#### Contributors

Pasicha Chaikaew (Chulalongkorn University), Pongsun Bunditsakulchai (Chulalongkorn University); Chen Liu (IGES), Kenji Asakawa (IGES), Atsushi Watabe (IGES), Sayaka Yano (IGES); Bruno Yamanaka (Akatu Institute), Fernanda Iwasaka (Akatu Institute), Larissa Kuroki (Akatu Institute), Beatriz Duarte (Akatu Institute); Paul Currie (ICLEI Africa), Jokudu Guya (ICLEI Africa), Solophina Nekasa (ICLEI Africa)

#### **Review and additional inputs**

Ryu Koide (IGES and NIES), Michael Lettenmeier (D-mat), Prabhakar S.V.R.K (IGES), Fernando Ortiz-Moya (IGES) Edina Vadovics (GreenDependent Institute), Francisco Javier Contreras Pineda (Universidade de Brasília), Mark Elder (IGES)

#### Copy Editor

David D. Sussman (IGES)

#### Layout Designer

Haruka Yamada

#### Suggested Citation

Institute for Global Environmental Strategies (IGES). 2021. New Delhi in 2030: Envisioning 1.5-Degree Lifestyles. Policy Report. Institute for Global Environmental Strategies (IGES), Hayama, Japan.



### **EXECUTIVE SUMMARY**

This scenario offers a work plan and vision for the city in 2030 to ascertain what is required for 1.5-degree lifestyles (1.5°C Lifestyles), defined as sustainable lifestyles compatible with by 2030. It suggests a plausible transition pathway to reduce the lifestyle carbon footprint from

New Delhi's projected average of 2,800 kg-CO<sub>2</sub>e/capita/year to 1512kg-CO<sub>2</sub>e/capita/year, compatible with the Paris Agreement's target of limiting global warming to 1.5°C above pre-industrial levels by 2100 (IPCC, 2018).

Current average per capita carbon footprint in New Delhi (2011-2019 reference data)	1.4t-CO <sub>2</sub> e/capita/year
Projected average per capita carbon footprint in New Delhi in 2030 based on estimated consumption growth	2.8t-CO2e/capita/year
2030 average per capita lifestyle carbon footprint in New Delhi after lifestyles change with assuming no improvements in renewable energy share and environmental efficiency from the current level	1.5t-CO <sub>2</sub> e/capita/year

As India's capital city, the pressures on New Delhi's ecosystem are without parallel among Indian cities, with urbanisation taking place at a rapid pace, and exerting tremendous pressure on the city's physical infrastructure and resources. Delhi is also one of the most polluted cities in the world, a fact highlighted by national and international media as the city fills with smog every winter. New Delhi's unique position as India's socio-economic capital, thronged with citizens from all walks of life, yet one of the most unhealthy cities to live in, makes exploring sustainable living both a challenge and an opportunity. New Delhi's average lifestyle carbon footprint is calculated based on the consumption amount and energy intensity for production across the domains of housing, food, mobility, goods, services and leisure. Based on domain-specific carbon footprint hotspots, thirty (30) low-carbon lifestyle options were identified based on project-wide extensive literature review. In order to define this scenario, and assess the feasibility of identified options, participatory workshops were conducted to incorporate the voices of citizens from New Delhi. Through two weeks of household experiments, a select group of these citizens implemented some of the identified low-carbon lifestyle options and helped to identify certain obstacles, as well as supporting measures to promote and facilitate sustainable lifestyles in the city.

Research identified three domains as major contributors to current emissions, i.e. food (37%), mobility (31%) and housing (28%) respectively, making them key focus areas with regard to individual lifestyle changes and systemic policy change, while keeping in mind the goals for 2030. Besides these three domains, the goods and services domains also contributed a combined 3.4% of the current emissions.

The food domain accounts for the highest carbon footprint (37%), and this is mainly because of the high consumption dairy products by the population of New Delhi. Fish and organic waste also show some contribution to the total footprint generated by the food domain in the study. Other components (e.g. meat, eggs, beverages) within this domain show a very limited footprint. Citizens expressed interest in adopting a more plant-rich vegetarian diet or reducing food loss in the supply chain as some of the more feasible low-carbon options. They highlighted the need for support from governments and companies in promoting organic food markets, at affordable rates, and also noted challenges with cutting down on dairy consumption in their daily diet.

The lifestyle carbon footprint analysed in this report, as well as the carbon footprint reductions associated with citizen behaviour change, assume average consumption values for New Delhi. Citizens' carbon footprints are highly variable, corresponding to differences in income, occupation, age, family structure and health. This report argues that it is possible to avoid the increase of the average lifestyle carbon footprint of citizens above the 2030 target (2.5tCO<sub>2</sub>e/yr per person), even as cities are expected to grow economically and increase consumption in the future. However, it is neither realistic nor desirable to expect all citizens to take the carbon footprint reduction actions described in the report, regardless of their different standards of living and diversity of needs such as mobility, housing and food.

The options identified for lifestyle carbon footprint reductions presented in this report supplement some of New Delhi's existing initiatives for reducing carbon emissions, as they can fast track the transition towards carbon neutrality by 2050. However, it shall be noted that the choice of options for a decarbonised lifestyle can vary among individuals and the findings of this report are indicative in nature and do not represent definitive future projections or targets. This report emphasizes that the transition to a decarbonised lifestyle depends on supportive measures from governments and businesses, in addition to the willingness of individual households.

### **CONTENTS**

1. INTRODUCTION	1
1.1 Background	1
1.2 The Scenario	3
2. METHODOLOGY	4
2.1 Quantitative Analysis	4
2.2 Participatory Consultative Process	5
3. OVERVIEW of BASELINE DATA	7
3.1 Food	8
3.2 Mobility	8
3.3 Housing	9
3.4 Goods, Services & Leisure	9
4. CITY VISION	11
4.1 Development of City Vision towards 2050	11
4.2 Key Themes of the City Vision towards 2050	13
4.3 Overview of the City Vision towards 2050	14
5. LIFESTYLE CHANGE TOWARDS 2030	15
5.1 Lifestyle change options and adoption rates	15
5.2 Change in lifestyle carbon footprints	18
5.3 Co-benefits of 1.5°C Lifestyles	18
6. RECOMMENDATIONS TO STAKEHOLDERS	20
6.1 Challenges/obstacles in implementing lifestyle changes	20
6.2 Recommendations to Stakeholders	21
7. CONCLUSIONS	23
8. REFERENCES	24



### **1. INTRODUCTION**

Current climate debates largely focus on production-based strategies to reduce carbon emissions. Production-based accounting covers direct emissions from a country's domestic production activities within its geographical boundaries and the offshore activities that it controls, but does not account for embodied emissions from international trade (Boitier 2012; Moore 2013). Consumption-based accounting (carbon footprinting) includes both direct emissions and embedded emissions due to the production and distribution of products and services, including imported products, reflecting the global impacts of individuals' final consumption and lifestyles. This approach addresses the carbon leakage in production-based strategies and promotes comprehensive mitigation options while not burdening developing countries with excessive emissions obligations (Peters and Hertwich, 2008).

The analysis of individual lifestyles offers the possibility of a comprehensive assessment of consumption-related carbon emissions in different domains of life such as housing, food, mobility, goods, services and leisure, as well as the links between them (IGES et al., 2019). Lifestyle carbon footprints can be assessed through national or city boundaries. Given the availability of consumption data, a city where an individual resides provides the appropriate geography to account for carbon emissions across production, distribution, use, and disposal of purchased products and services, including those embedded in trade.

This city scenario provides recommendations on how to substantially reduce consumption-based carbon emissions, achieved by 2030 through the decarbonisation of lifestyles and developed in consultation with citizens of New Delhi<sup>1</sup>, who were selected by Swechha based on their existing network and practical considerations for project implementation. This scenario asserts that the adoption of low-carbon lifestyle options relies on supporting measures by governments and businesses to facilitate individuals' efforts, and emphasises the importance of collaboration by all stakeholders.

#### 1.1 Background

New Delhi is the capital of India and has been the country's primary focus of socio-economic and political activities. This report refers to the National Capital Territory of Delhi as New Delhi. The total population of New Delhi, comprising both its rural and urban areas, is over 16 million, as based

1 New Delhi citizens refers to the residents of New Delhi who participated in project workshops and subsequent household experiments.

on the 2011 census. As India's capital city, the pressures on New Delhi's ecosystem are without parallel among Indian cities, with urbanisation taking place at a rapid pace, and exerting tremendous pressure on the city's physical infrastructure and resources. Of a total area of 1,483 square kilometres, over 50% has already been urbanized and the rest is facing heavy urbanization pressures (Pathway to Low Carbon City, Delhi, 2009). Hence, critical reform is necessary, within the existing policies, in order to ensure the integration of environmental justice, sustainability and resilience within the current social, economic and political framework, and to build a sustainable and resilient future.

During the last five years, the Delhi Government has undertaken various initiatives to support sustainable development. For example, in 2015 it introduced the country's first-ever 'water policy', to address the increasing threat of water scarcity in the city (Skymet Weather Team, 2015). The policy focuses on the treatment and reuse of wastewater, along with means of water conservation. Other actions include developing a 'Green Delhi Initiative', launched in 2016, to plant mainly pollutionabsorbing plants across Delhi's roads and flyovers, covering a total area of more than 126 acres in its first phase. The Delhi Metro Rail Corporation (DMRC) has also begun several initiatives to promote sustainable infrastructure and sustainable lifestyles. This includes the launch of a youth-run eco-club called "Swachch Chetna", focused on encouraging school students to not just be more eco-friendly, but also actively participate in programs and activities that promote sustainable goals. As recently as June 2021, the Delhi Development Authority (DDA) launched its working draft for the city's masterplan for 2041. It serves as the key instrument in facilitating the city's overall development by noting present conditions, as well as guiding the way forward towards the desired future. As per the draft plan, the primary focus areas highlighted are water, environment, critical resources, housing, mobility, the built environment and public places, vulnerability, economic potential, heritage assets and monitoring and evaluation (Rajput, 2021).

#### Figure 1.1 Existing initiatives by the Delhi government, businesses and citizen groups



Prominent citizen-led initiatives and groups in New Delhi and its adjacent areas include IAMGurgaon (https://iamgurgaon. org/), My Right to Breathe, Let Me Breathe, New Delhi Nature Society (https://www.ndns.in/), and Delhi Tree SOS, among several others that have also actively advocated for various issues pertaining to environment and sustainability. Some examples include holding community workshops/talks/ lectures on sustainable practices in partnership with leading experts, organizing citizen town-halls, campaigning on climate change, conducting tree plantation drives, and building community nurseries. Several hotels, eateries and businesses have adopted innovative replacements for single-use plastic, including switching to paper and steel straws, or using reusable wooden cutlery and jute takeaway bags. Large businesses such as Zomato,<sup>2</sup> are working towards promoting more 'climate conscious deliveries' by funding local environmental projects to offset their carbon footprint. Presently, 35% of their deliveries in Delhi are carried out on cycles instead of motorcycles (Pedalandtringtring, 2021b). Corporate giants such as Philips India, IndusInd Bank, HCL and ITC LTD, among others, have also initiated several low-carbon initiatives in partnership with local organisations. These are focussed on issues related to waste management, urban afforestation, and sustainable education, which have also helped in promoting sustainable livelihoods in communities.

2 Zomato is an Indian multinational restaurant aggregator and food delivery company founded by Deepinder Goyal, Pankaj Chaddah, and Gunjan Patidar in 2008.

To summarize, New Delhi already has several initiatives, led by various stakeholders including governments, businesses, and citizen groups, and oriented towards sustainable development. There is also a strong commitment to transition towards a carbon-neutral future. However, a more comprehensive and holistic approach towards low-carbon living and sustainable lifestyles, with equal participation and collaboration across all stakeholders involved has received limited attention so far.

#### 1.2 The Scenario

Developed in partnership with citizens, this scenario— New Delhi in 2030—is an attempt to provide actionable options to reduce lifestyle carbon footprints,<sup>3</sup> and towards realising 1.5°C Lifestyles. These sustainable lifestyles are defined as being compatible with the 1.5°C Lifestyles target of the Paris Agreement, limiting global warming to 1.5°C above pre-industrial levels. Based on the 1.5°C Lifestyles technical report (IGES et al., 2019), the lifestyle carbon footprints targets are set at 2.5 tCO<sub>2</sub>e/capita by 2030.

Since the choice of a decarbonised lifestyle is personal, and can vary from one person to another, the choice of specific low-carbon lifestyle options across the domains of housing, food, mobility, goods, services and leisure that suit individual preferences and needs is crucial. The first step, before choosing lifestyle options, is benchmarking the average carbon footprint of individuals and identifying hotspots for footprint reduction across the domains. The New Delhi citizens' average lifestyle carbon footprint and its related hotspots provide both policymakers and citizens with an indicative carbon footprint benchmarking, its hotspot analysis along with 30-actionable lifestyle change options, specific to New Delhi's culture and social economic context. These options are also in line with a city vision concept, developed through a participatory workshop about the desired lifestyles and future vision of the city. An individual citizen's preference among these 30-options is indicated by the rate at which they are adopted. Each option also lists a series of supporting measures that governments and businesses can provide in paving the roadmap towards carbon neutrality. The overall scenario focuses on the importance of collaboration, and how each stakeholder, i.e. citizens, governments, and businesses, have an important role to play in achieving the desired future of the city.

This scenario aims not only to encourage citizens to make environmentally conscious choices in their daily lives, but also to spur action by other stakeholders, including the government and business sector, that enable and facilitate such choices by these citizens. In other words, our objective is to inspire citizens, governments, and businesses to embrace and promote conscious living, while broadening the commitment and capacity for action to include not only policymakers but every citizen and resident of New Delhi regardless of their age, gender, nationality, and socioeconomic status.

The next section details the methodology used to develop this scenario. Sections 3, 4, and 5 introduce the project findings for the average baseline carbon footprint in New Delhi, desired future vision of the city, and low-carbon lifestyle options across the housing, food, mobility, goods, services, and leisure domains. Section 6 identifies the supporting measures for different low-carbon lifestyle options and recommends actions for various stakeholders to facilitate the transition towards 1.5°C Lifestyles.

<sup>3</sup> Lifestyle carbon footprints are GHG emissions directly emitted and indirectly induced from the final consumption of households, excluding those induced by government consumption and capital formation such as infrastructure (reference to 1.5°C Lifestyles report).



### **2. METHODOLOGY**

To co-create the scenario, a twofold research method was adopted, consisting of quantitative analysis and a participatory consultative process. The key steps under each of these methods are elaborated below.

#### 2.1 Quantitative Analysis

This methodology was used to calculate New Delhi's baseline carbon footprint, both to identify hot spots for carbon footprint reductions in each domain, as well as estimate the potential and feasibility of adopting these low-carbon lifestyle options.

#### Step 1: Calculation of New Delhi's Average Carbon Footprint

• The carbon footprint calculation took into account the consumption amount and energy intensity for production of different items across the domains of housing, food, mobility, goods, services and leisure.

- These six domains were selected since they account for over 75% of lifestyle consumption.
- The baseline footprint was calculated by aggregating the carbon footprint of 83 lifestyle items across the above-mentioned six domains, based on reference data from 2011-2019.
- The monetary-based consumption amount and intensity data were hybridized to incorporate physical units of consumption considering the local price information.

#### Step 2: Hot Spot Analysis

 Assessment of carbon footprints across housing, food, mobility, goods, services and leisure enabled a comparative analysis to identify which of these domains accounts for the maximum carbon footprint within Delhi.

- Taking a closer look at each domain enabled identification of the carbon footprint hotspots. Here, hot spots were defined as the individual lifestyle items that have either high consumption amounts, high carbon intensity in production, or both.
- Hot spot analysis aided in identifying lifestyle options that have maximum potential to reduce carbon footprints.

#### Step 3: Development of Lifestyle Carbon Footprint Reduction Options

- Based on the analysis of the lifestyle domains, 30 lifestyle carbon footprint reduction options were identified as per the city's present conditions.
- These options were graphically illustrated and presented in an options catalogue. The options catalogue provided simplified communications tools with citizens during the workshops.
- The carbon footprint reduction potential of the 30-lifestyle options was used to design a puzzle game.

#### Step 4: Estimation of Aggregated Reduction Effects

- There are many interactions among lifestyle carbon footprint reduction options. For example, teleworking reduces commuting distance and consequently affects reduction potentials by shifting car commuting to other methods of low-carbon mobility.
- A detailed and aggregated reduction effect for implementing multiple options was not estimated in this report. Hence, after adopting the 30 options, the actual lifestyle carbon footprint reduction potentials can be lower than calculated in this scenario.

#### 2.2 Participatory Consultative Process

This process aimed to reflect citizens' ideas/opinions through an on-line workshop, a two-week household experiment, and one-on-one calls with a select group of citizens from New Delhi. The findings were used to assess the feasibility of the identified low-carbon lifestyle options, and to determine supporting measures.

#### Step 1: Online Workshop (March 2021)

 A total of 42 citizen participants were recruited, based on their availability and interest in being a part of the study.

- All participants belonged to middle class/upper middleclass families. The overall age group of participants ranged from 21 – 65 years.
- A total of 20 male participants and 22 female participants attended the online workshop.
- The first online workshop introduced participants to concepts such as climate change, global warming and greenhouse gas (GHG) emissions. They were also presented with an overview of India's and New Delhi's current carbon footprint, and its increase due to the impact of various sectors and stakeholders.
- Through a puzzle game, participants were requested to select from a pool of 30 low-carbon lifestyle options, as well as select their feasible adoption rates,<sup>4</sup> that would enable citizens of New Delhi to reduce their carbon footprint towards achieving a 1.5°C Lifestyles target of 2.5t-CO<sub>2</sub>e/capita/year by 2030.
- Participants selected 13 feasible options from the list of 30 provided, and also stated their respective adoption rates.
- The details of the proposed two-week-long household experiment were explained to all participants. They were provided with all necessary resources to carry out this experiment, including a data recording sheet and an activity sheet, and were requested to take photos to document the process. The daily recording methodology was then explained to each of the interested participants.

#### Step 2: Household Experiment

Initially, the plan was for this study's authors to visit households and interview participants during this step. Due to strict restrictions resulting from the second wave of the COVID-19 pandemic in India, all daily check-ins and followups were made via WhatsApp/email, and/or phone calls with the participants. The objective of the household experiment was to identify the obstacles in implementing 1.5°C lifestyles and apply this analysis in the recommendations for multi-stakeholder collaboration.

• The household data recording sheet that was provided to the participants enabled them to document their journey through the two-week experiment.

<sup>4</sup> Adoption rate indicates how widely and fully options will be implemented. For example: If the adoption rate is 100% it means all citizens eligible to implement a low-carbon lifestyle option will fully implement the option.

- The sheet had different elements focussed on questions specific to planning and preparation, as well as materials needed to conduct the experiment at home.
- The sheet also enabled participants to document their respective daily implementation rate (e.g. 100%, 75%, 50%, 25%, or 0%) for the selected options during the two weeks.
- The final section of the data recording sheet enabled participants to provide a detailed self-assessment and documentation of any challenges/obstacles encountered along the way.
- Participants expressed the challenges with daily documentation using the recording sheets, and hence many of the obstacles and challenges they shared, as well as reported feedback, were noted during the check-in calls.
- Based on the analysis of information collected during the first workshop and household experiment, a draft narrative for the city scenario was designed and developed.

#### Step 3: One-on-one Calls

• The draft scenario, New Delhi in 2030, was presented to the project participants to get their feedback.



### **3. OVERVIEW of BASELINE DATA**

New Delhi's total per capita carbon footprint, based on reference data between 2011 - 2019, is  $1437.78 \text{ kgCO}_2/$  cap/yr or 1.4t-CO<sub>2</sub>e, which is lower than the 2030 target of 2.5t- CO<sub>2</sub>e. However, with estimates of economic growth, the consumption of commodities in New Delhi and India is likely to increase over the coming years, resulting in a higher lifestyle carbon footprint than 1.4t-CO<sub>2</sub>e in 2030. Using the projected consumption growth based on GTAP calculations (Aguiar et al., 2019),<sup>5</sup> The carbon footprint in New Delhi, for the year 2030 was estimated as 2,800kgCO<sub>2</sub>/cap/yr or 2.8t-CO<sub>2</sub>e.

With the current carbon footprint of 1.4t-CO<sub>2</sub>e, food (537.11 kgCO<sub>2</sub>), mobility (450.8 kg CO<sub>2</sub>) and housing (398.8 kgCO<sub>2</sub>) generate a higher carbon footprint in New Delhi. The goods (48.32 kgCO<sub>2</sub>) also generate a small proportion of carbon footprint, but currently the other two domains (i.e. services and leisure) generate negligible footprints. The contribution

of services to the overall carbon footprint is low because in India they are generally much cheaper as compared to other countries. Also, it is not common among Indians to have general insurance at a personal level. Similarly, the carbon footprint for leisure is only based on entertainment expenditures. The average citizen of New Delhi hardly goes out for dining, recreation or hotel stays due to financial constraints.

Based on our calculations for dynamic projections for 2030, the carbon footprints of food, mobility and housing are set to increase to 791 kgCO<sub>2</sub>, 991 kgCO<sub>2</sub>, and 889 kgCO<sub>2</sub> respectively. It is also estimated that in the future, goods, services and leisure would also account for a larger carbon footprint.

The hotspot analysis and reasons behind the existing higher footprints in each particular domain are explained below.



#### Figure 3.1 Distribution of carbon footprint in different domains

5 The Global Trade Analysis Project (GTAP) is a global database describing bilateral trade patterns, production, consumption and intermediate use of commodities and services (Aguiar et al., 2019).

#### 3.1 Food

A high carbon footprint in the food domain is mainly due to the consumption of dairy products by the population of New Delhi, who are mostly vegetarian due to the extreme heat in

Figure 3.2 Hotspot analysis in Food domain



#### 3.2 Mobility

The mobility domain identifies the use of buses, motorcycles, and trains for transport as major hotspots. The reason behind the high footprint of buses is the establishment of metro trains in New Delhi. The metro train has reduced the load on buses in terms of number of passengers, but the number of



Figure 3.4 Hotspot analysis in Mobility domain

major portions of the year. Fish and organic waste also show some contribution to the total footprint generated by the food domain in this study. Other components within this domain (e.g. meat, eggs, beverages) show very limited footprint.

Figure 3.3 Carbon intensity and consumption amount in Food domain



buses and their routes remain the same. Due to this decline in the number of passengers, the per-capita footprint from buses has increased. Higher numbers of motorcycles are sold in India in comparison to cars because of the improving economic conditions of an average middle class individual. This has led to a greater increase in the footprint generated by two-wheel vehicles as opposed to four-wheel vehicles.



Figure 3.5 Carbon intensity and consumption amount in Mobility domain

Amount of mobility distance (km-passenger/cap/year)

#### 3.3 Housing

Construction and electricity consumption are generating most of the carbon footprint in the housing domain. Construction is one of the identified hotspots in this study because almost every building in New Delhi is made of reinforced concrete (RCC), and cement mortar is one of the





#### 3.4 Goods, Services and Leisure

The carbon footprint for various elements of the goods domain shows that sanitation/medicine generate the highest environmental impact. Consumption of clothes and individual hobbies also generate significant carbon footprints in this domain. Apart from this, consumption of appliances, electronics and furniture shows a comparatively negligible





main materials used to make RCC buildings. In addition, there are always many ongoing construction projects in the capital region. Electricity is also identified as a hotspot in the housing domain. Coal accounts for more than 60% of the Indian electricity mix, and it generates a higher carbon footprint compared to other natural and renewable sources.





footprint. For the service domain, education has the highest impact, followed by communication, personal care, and welfare/medical components. Entertainment is the only component shown to generate a footprint in the leisure domain. Other components (e.g. restaurants, hotels, or recreation) in this domain do not show any footprint because reliable data was not available for the New Delhi region.





Amount of consumption (USD/cap/year)





Figure 3.11 Carbon intensity and consumption amount in Service domain



Figure 3.12 Hotspot analysis in Leisure domain

100%

Cultural





Amount of consumption (USD/cap/year)



### **4. CITY VISION**

- Citizens of New Delhi would like to: preserve community spaces in the city, have improved mobility infrastructure, embrace responsible consumption, promote mind-sets for an environmentally friendly lifestyle.
- New Delhi in 2050 shall be at the forefront of good public transport infrastructure', a steward of ecological resource management', and have active community participation and representation at all levels of governance.

The City Vision towards 2050 was developed to provide a future direction for 1.5°C Lifestyles that aims to simultaneously achieve good quality of life and a large carbon footprint reduction. New Delhi's city vision for 2050 was designed through a participatory consultative approach, involving detailed conversations with participants from workshops and the household experiment on reimagining the city. The year 2050 was selected for an envisioning exercise to enable the workshop participants to come up with truly sustainable futures and not be restricted by existing systemic lock-ins.

The following section elaborates on what participants would retain from or increase within the city as it is today, and what they would want to see changed by 2050. Broadly, participants echoed our sentiment that building a sustainable New Delhi would involve a three-pronged approach – (i) individual changes in the lifestyles of residents, (ii) collective action through community engagement, and (iii) systemic policy-level and governmental changes through advocacy.

#### 4.1 Development of City Vision towards 2050

Some issues that emerged from our discussions were: **Preserving community spaces in the city**: Participants felt a strong connection to the city's rich cultural heritage, which includes several heritage sites, monuments, green spaces, and city forests. They also associated the city with community markets and places for neighbourhoods to gather, particularly during festivals, and in outdoor spaces of different kinds for leisure activities. New Delhi has over 18,000 public parks that are used by residents for various activities, on a daily basis, including exercise, meeting friends, picnics and social outings.

**Improved mobility infrastructure:** New Delhi is one of both India's and the world's most polluted cities. It has experienced 250 days in a calendar year with the Air Quality Index reading over 999 on Pm 2.5. Participants identified air pollution caused by vehicles as a major factor affecting the city's air quality, and proposed higher adoption rates of other modes of travel, including public transport and bicycling, as part of the solution. Participants referred to better infrastructure for pedestrians and cyclists, such as more cycle parking stands and charging stations, cyclefriendly roads, and footpaths which are used solely for walking. During our conversations with participants, they also highlighted that the city's infrastructure is not disabledfriendly and this is an aspect that has to be kept in mind when thinking about a sustainable city.

**Responsible consumption:** Citizens said that they would want to live in a New Delhi in 2030 that had more responsible consumption habits. They discussed the importance of adopting more sustainable and intentional consumption practices, such as segregating waste to enable more recycling, reusing waste, reducing material consumption – mainly plastics by cutting down on takeout food using reusable packaging and containers – and practice buying used goods.

**Changing mind-sets**: Some participants also recalled that they were often shamed and name-called for adopting environment-friendly lifestyle changes and trying to involve their communities in these practices. An approach that was offered to increase the acceptability of adopting sustainable lifestyles is the increase in government-citizen partnerships and collaborative activities across residential areas, as well as involving citizens in urban planning.

#### Public spaces and community parks in New Delhi







#### 4.2 Key Themes of the City Vision towards 2050

Analysis of citizens' overall vision for New Delhi in 2030 highlights the following major themes: 'Mobility/Public transport infrastructure', 'Ecological resource management', & 'Active community participation and representation'

#### Theme 1: Mobility/Public transport Infrastructure

Issues or Requests	Solutions (example)
Congestion on roads; Vehicular pollution	<ul> <li>Improved security, and supporting infrastructure for general public (e.g. more street lights near bus stands, ramps)</li> <li>Promotion of car free days, i.e. certain sections of busy roads are closed for all cars for a particular Sunday of the week.</li> <li>More frequent implementation of New Delhi's "Odd-Even Vehicles policy"</li> <li>Workplaces promote usage of public transport, car-pooling, and teleworking for employees</li> </ul>
Lack of public transport infrastructure	<ul> <li>Roll out of more public buses and increase in frequency</li> <li>Additional routes</li> <li>Integrating cyclist/pedestrian friendly roads</li> </ul>

#### Theme 2: Ecological Resource Management

Issues or Requests	Solutions (example)
Lack of regulation of construction activities/ large-scale development projects	<ul> <li>Regulation of construction activities (e.g. ban on construction on river floodplains)</li> <li>Promoting sustainable construction materials alternatives</li> <li>Prioritizing New Delhi's rich ecological history, and its trees and forest cover</li> <li>Regulating deforestation activities carried out across communities in the name of "redevelopment projects"</li> </ul>
Disappearing green spaces	<ul> <li>Maintenance of public parks</li> <li>Planting of native species</li> <li>Restoration of the Delhi Ridge (revival of native species and green cover)</li> </ul>
Rising landfills	<ul> <li>Training of households and municipalities on effective segregation of waste</li> <li>Promoting sustainable practices in communities/households, such as reusing and reducing material consumption (plastic waste in particular)</li> </ul>
Water pollution	<ul> <li>Regulation of industries directly contributing through discharge of toxic industrial pollutants into the river</li> <li>Blanket bans on illegal construction activities on river floodplains</li> <li>Need for more functional Sewage Treatment Plants (STP's) to regulate untreated sewage wastewater entering the river</li> <li>Regulating groundwater usage for agricultural activities (excessive usage of hand-pumps)</li> </ul>

#### Theme 3: Active Community participation and representation

Issues or Requests	Solutions (example)	
More community engagement	<ul> <li>Voices of citizens to be heard in policy drafting</li> <li>Reimagining public spaces with sustainability and green practices at their core</li> <li>Citizens working with state agencies to build more community-friendly, and accessible markets, parks, and other public spaces</li> </ul>	
More engagement of youth	<ul> <li>Building sustainable schools</li> <li>Promoting and integrating sustainability within each school's curriculum</li> <li>Inviting innovations/ideas/designs and visions from young people about what New Delhi should look like</li> </ul>	
More responsible consumption habits	<ul> <li>Promoting practices such as reuse and recycling of household goods, and reducing materialistic consumption</li> </ul>	
Changing mindsets around sustainable practices and lifestyle habits	<ul> <li>Citizens - State participatory model</li> <li>More engagement of government in highlighting local 'green champions', promoting their work</li> <li>Collaboration between local NGOs, and Resident Welfare Associations</li> </ul>	

#### 4.3 Overview of the City Vision towards 2050

The participatory process confirmed that citizens feel a strong connection with the city's rich cultural and ecological heritage, which includes several heritage sites, monuments, green spaces, and city forests. They also associate the city with community markets and places for neighbours to gather, particularly during festivals, and in outdoor spaces of different kinds for leisure activities. In addition, they believe that strong collective action, with a participatory approach, is essential in building a sustainable future for the city of New Delhi. Citizens have highlighted the importance of changing the current mindset and narrative around sustainable day-to-day practices, particularly related to the individual households and communities. They argue for a strong citizen-state participatory model, focused on highlighting the work of local 'green champions' or environmental stewards, rather than shaming and name-calling them. The desired future of the city of New Delhi, or its vision for 2050, is centred

around three agents of change i.e. (i) individual changes in the lifestyles of residents, (ii) collective action through community engagement, and (iii) systemic policy-level and governmental changes through advocacy.

While certain supporting measures and state policies (e.g. those centred around specific goals for achieving a more sustainable and eventually carbon neutral future) are essential, citizens also highlighted the importance of 'going back to one's roots', leading a more climate conscious lifestyle, one that is particularly less consumption-based and more minimalist. Most of the 30 identified low-carbon lifestyle options were considered feasible and relatively easy to implement by citizens (particularly from the housing, food, and goods domains), and they expressed their willingness to adopt lifestyle changes such as switching to energy efficient appliances, reusing waste, reducing electronic goods consumption, switching to a plant-rich diet, and reducing the loss of food in the supply chain, on a more regular basis.



### **5. LIFESTYLE CHANGE TOWARDS 2030**

- The selected lifestyle change options can reduce the projected lifecycle carbon footprint of 2800 kg-CO<sub>2</sub>e by 1319 kg-CO<sub>2</sub>e/capita (from 2,800 to 1512 kg-CO<sub>2</sub>e/capita), based on simple summation of different options.
- Among major consumption domains, substantial footprint reductions can be achieved across the food (-68%), goods (-52.2%), and leisure (-50.6%) domains.
- In the housing (-47.3%) and mobility (-24.3%) domains it is relatively difficult to reduce carbon footprints.
- The proposed lifestyle changes are expected to also bring about various co-benefits such as economic benefits through reduced operation costs (e.g. less energy expenditure) or reduced consumption expenditures, as well as health benefits (e.g. shifting from cars to bicycles, and increasing plant-based diets)

#### 5.1 Lifestyle change options and adoption rates

There are six strategies associated with each lifestyle change option, i.e. 'Reduction', 'Shifting types', 'Efficient products', 'Using behaviour', 'Disposal behaviour', and 'Durable infrastructure'. 'Reduction' is the primary strategy that should be adopted for all selected options in the mobility, housing, food, goods and leisure domains. 'Durable infrastructure' should be a secondary strategy for options such as 'Moving closer to work and services' and 'Using public transport even for intercity travel', because accommodations are required near the workplaces. Efficient products should be the primary strategy for options such as solar water heaters because of low efficiency. After improvement in efficiency, reduction will be a secondary strategy. Shifting to alternative fuel types like biofuel will help to reduce the carbon footprint. Hence, 'shifting types' will be the primary strategy and 'reduction' will be the secondary strategy for this selected option. The option of 'reduce plastic consumption' in the goods domain can only be achieved through the strategy of shifting types because it requires innovation to find the alternate material. 'Shifting types' should also be adopted as the primary strategy for the option 'exercise without machinery' in the leisure domain, so as to reduce the carbon footprint. The 30 lifestyle change options for all six approaches were presented at the citizen-participatory workshop, and the participants were asked to select options considering their mitigation potential and potential contribution to the City Vision. The selected options in the New Delhi scenario are listed in the following tables (Tables 5.1 - 5.5), with their respective mitigation potential (based on assuming a 100% adoption rate) and the assumed adoption rates in 2030. Respective adoption rates were determined based on the results of the first workshop.

Table 5.1 shows selected mobility options. Usage of private vehicles will be substantially reduced due to improved public transport facilities. Most citizens had expressed an interest in adopting public transport as a more frequent mode of mobility across the city, and for long distances in particular. The adoption rate for teleworking/working remotely is also extremely high, due to the COVID-19 situation in the country. Most participating citizens also noted that they would continue to use this as a preferred option in the post-COVID future as well. This will significantly reduce vehicular congestion on the roads.

#### Table 5.1 Selected mobility-related options

Option	Mitigation Potential (kgCO2e/cap/yr)	Adoption Rate (%)
Teleworking/working remotely	297.24	100
Use public transport	66.36	50

Table 5.2 shows selected housing-related options. Relatively simple options such as switching off appliances when not in use can be easily adopted by most individuals. One participant selected installing rooftop solar as a feasible

option, although most argued that it would be a relatively difficult option to implement due to its high-cost and the issue of affordability.

#### Table 5.2 Selected housing-related options

Option	Mitigation Potential (kgCO2e/cap/yr)	Adoption Rate (%)
Switching off appliances when not in use	39.16	100
Installing rooftop solar	357.89	75

Table 5.3 shows selected food-related options. Many citizens argued that they can make efforts to reduce food loss in the supply chain, by either growing their own food at

home, or eating in limited quantities. They also stated that they could reduce their dependence on frequently ordering out food from restaurants/suppliers.

#### Table 5.3 Selected food-related options

Option	Mitigation Potential (kgCO2e/cap/yr)	Adoption Rate (%)
Eating organic food	296.89	100
Reduction of food loss in supply chain	266.62	100

Table 5.4 shows selected goods-related options. The greatest number of options were selected under this

domain. These included reducing plastic waste, reducing household consumption, recycling/reusing of waste at

the household level, repairing broken/damaged goods, and using second-hand goods and rented items. Citizens highlighted the need for a culture of 'repair', 'reuse', 'recycle', and barter in the city, through the integration of thrift shops, local resale markets, and yard sales, within community markets.

Table 5.4	Selected	goods-related	options
-----------	----------	---------------	---------

Option	Mitigation Potential (kgCO2e/cap/yr)	Adoption Rate (%)
Recycle household waste	4.49	75
Reduce and reuse waste	34.40	50
Use rented items	1.03	50
Buy second-hand goods	34.40	50
Repair broken/damaged/torn goods	34.40	100
Reduce plastic consumption	0.86	75

Table 5.5 shows selected leisure-related options. Out of the three options, citizens highlighted two of them as easily feasible. The first option was the usage of E-books instead of hard copies, as most citizens highlighted that they have already made the switch to digital reading or have been planning on doing so in the future. The second option highlighted by citizens was the feasibility in reducing extravagance in weddings. Weddings and cultural events/ celebrations in India are usually celebrated at a grand scale, with hundreds of guests and attendees, usage of several materialistic goods, and with huge amounts of money spent

on each event. At the same time, these celebrations have a very high footprint, and are not environmentally friendly. Citizens argued that while it may take some time to change the current narrative and mindset around the way they celebrate cultural events/weddings in particular, it is extremely essential to understand the importance of reducing this extravagance in celebrations, owing to the large implications this has on increased carbon footprints (from boarding and lodging guests in hotels, to catering facilities, and large sums of money spent on various materialistic items).

Option	Mitigation Potential (kgCO2e/cap/yr)	Adoption Rate (%)
Use E-books instead of hard copies	40.06	100
Reduce extravagance in weddings <sup>6</sup>	10.15	50

#### Table 5.5 Selected leisure-related options

It is important to highlight here that these proposed lifestyle change options have been assumed to be implemented by those citizens who are both willing to carry them out, and whose living situation has infrastructure that enables them to do so. It should also be noted that while options such as 'eating organic food', or installing rooftop solar indicate a very high adoption rate (75-100%), in this particular case study, the participants' background should not be viewed as a representation of New Delhi's overall demographic socioeconomic background. Majority of the participants that were a part of the puzzle game, belong to an upper middle class economic strata, and can afford to invest in infrastructure such as rooftop solar, or purchasing organic food. Overall, it can be observed that a target of 1500kg/ CO<sub>2</sub>/Cap/Yr can be observed by 2030 provided supporting measures are provided by governments and businesses.

<sup>6</sup> For calculation of this particular option, we have considered only attendees (guests), who attend the functions from the city as well as outside. The reduction potential we have assumed is 0.5% across all other domains.

These supporting measures across the different domains have been highlighted in the next section, under Recommendations to Stakeholders.

The scenario aims to provide ideas towards realising a 1.5°C Lifestyle for citizens of all backgrounds, regardless of age, physical conditions, occupational situation, family composition, access to public transport and shopping areas, and also value judgement. The proposed adoption rates imply that this scenario should not be interpreted as a prescription for all citizens. The adoption rates are only indicative figures that account for workshop participants' expectations as well as their feasibility assessment in 2030, and should not be interpreted as future projections or targets.

#### 5.2 Change in lifestyle carbon footprints

Currently, it can be observed that the housing, food, and mobility domains are responsible for the majority of New Delhi's overall carbon footprint generation. Based on our calculations for dynamic projections for 2030, these numbers are projected to increase to 791 kgCO<sub>2</sub>, 991 kgCO<sub>2</sub>, and 889 kgCO<sub>2</sub> respectively. In order to achieve our goal of reducing the city's current carbon footprint of 2,800kgCO<sub>2</sub>/cap/yr to 1512kgCO<sub>2</sub>/cap/yr, substantial lifestyle changes in each of these domains would be required. Our short puzzle game exercise in the online workshop highlighted a total of 14 options across each domain that would help in facilitating this change. As evident from Figure 5.1, substantial changes in lifestyle carbon footprints can be seen in the food, mobility and housing domains, with the potential of reducing footprint by 300 - 700 kgCO<sub>2</sub>/cap/yr in 2030.





#### 5.3 Co-benefits of 1.5°C Lifestyles

Over half the population of the world now lives in urban areas. This means that efforts to meet human development goals and sustainable-oriented growth can only be achieved through a concentrated focus on low-carbon initiatives and measures in cities.

The suggested lifestyle modification initiatives would affect not just home consumption but also communities and other key stakeholders at large. These low-carbon measures, as highlighted in this scenario, can help achieve a range of development goals and broad benefits including better employment opportunities, improved public health and social wellbeing, improved accessibility, and social inclusion, thereby paving the way for a more resilient and sustainable society. Across each domain, it can be noticed that the benefits go far beyond just reducing carbon emissions through adoption of low-carbon lifestyle options. Some of these broader benefits are highlighted below:

In regard to the mobility domain, improved public transport infrastructures and reduced dependency on private vehicles will result in less congestion on roads. In addition to this, it will also address the major issue of air pollution in the city. Supporting measures such as an improved public transport network, integration of safety measures for women, elderly and the disabled in particular, will significantly help in promoting public transport (especially usage of public buses in the city), as a preferred mode of transport across long distances. The integration of cycle lanes, and pedestrianfriendly paths, would also ensure a healthier lifestyle for many citizens. Promotion of initiatives such as 'No Car Days', ridesharing, and carpooling will also promote community participation and engagement. In terms of the housing and goods domains, switching to energy efficient appliances will significantly reduce energy bills. Reducing waste at home by practicing basic segregation, and reusing/recycling old household goods, will result in less hoarding, and less overall consumption, thus contributing towards a more sustainable lifestyle among citizens. Integration of thrift shops, eco stores, recycled/ reusable goods markets within community markets, and mainstream markets, will also facilitate strong community engagement, and promote a culture of 'borrow' and 'barter' in the city. Citizens also highlighted the importance of reusing household waste (in particular kitchen waste) for composting activities at home. This would not only help pave the way for reduced waste in the kitchen, but would also greatly benefit citizens through adoption of a new sustainable hobby and lifestyle practice.

Regarding the food domain, options such as reducing food loss in the supply chain will contribute towards not only reducing overall GHG emissions, e.g. through transportation or packaging, as well as household wastage, but will also promote healthy lifestyle practices such as growing one's own food, and eating an organic home-grown healthy diet for at least a few days each week.

Related to the leisure domain, reduction in footprints from reducing extravagance at cultural events and weddings can result in building a more sustainable and resilient society. Citizens highlighted the importance of questioning some of our current practices with regard to large scale spending at such events, and switching to more sustainable, ecofriendly and green oriented events. They also highlighted the involvement of governments, and other stakeholders in promoting sustainable events and cultural festivals in community markets.



### **6. RECOMMENDATIONS TO STAKEHOLDERS**

### 6.1 Challenges/obstacles in implementing lifestyle changes

During our follow up calls, as well as final closing interviews, study participants addressed some key challenges, obstacles, and barriers with regard to adopting certain low-carbon lifestyle options. These challenges shed light on the current context, and what can and needs to be done in order to ensure behavioural change across all domains. They focus on key supportive measures that various stakeholders, i.e. Government, Policy Makers, RWAs (resident welfare associations) and Communities, as well as what companies and service providers, can provide to citizens, in order to achieve carbon emission targets for 2030. All these options in which obstacles were highlighted and addressed are mentioned in Table 6.1 below.

Domain	Option	Barriers / Obstacles
Food	Plant-rich food diet (Vegan)	Difficult to cut down consumption of dairy products
Food	Eating Organic	Expensive and inaccessible in larger markets
Food	Reducing food loss in the supply chain	<ul> <li>Often ordering too much food</li> <li>Not able to store in house for extended periods resulting in wastage</li> <li>More awareness and training required on practices for growing of home-grown food</li> </ul>
Housing	Installing rooftop solar	<ul><li>Lack of infrastructure and resources</li><li>Affordability</li></ul>

#### Table 6.1 Domain options and their respective barriers/obstacles

Domain	Option	Barriers / Obstacles	
Housing	Installing solar water heater	<ul><li>Lack of infrastructure and resources</li><li>Affordability</li></ul>	
Housing	Installing motion sensing lights	<ul><li>Lack of infrastructure and resources</li><li>Affordability</li></ul>	
Mobility	Moving closer to work/services	Seen as a long-term investment	
Mobility	Using cycles	<ul> <li>Lack of cycle-friendly roads</li> <li>Congestion and traffic on roads</li> <li>Safety issue on roads</li> <li>Already owning a private vehicle</li> <li>Prefer usage of public transport as means of travel</li> </ul>	
Goods	Buying second-hand clothes	<ul> <li>Lack of awareness around thrift culture</li> <li>Lack of infrastructure (e.g. thrift shops, yard sales)</li> <li>Cultural issue and pre-existing mind-set around using old/borrowed items</li> <li>Fast fashion and regular sales resulting in increased buying of new clothes</li> </ul>	
Goods	Buying second-hand items/goods	<ul> <li>Lack of awareness around thrift culture</li> <li>Lack of infrastructure (e.g. thrift shops, yard sales)</li> <li>Quality of items</li> <li>Cultural issues and pre-existing mind-set around using old/borrowed items</li> </ul>	
Goods	Using rented items	Same as above	
Goods	Reducing plastic waste	<ul> <li>Increased dependency (e.g. ordering food in plastic containers from outside, Amazon deliveries)</li> <li>Unable to track daily consumption</li> <li>Unaware of how to recycle/reuse certain plastics in effective manner at home</li> </ul>	
Leisure	Reducing extravagance at weddings	<ul> <li>Cultural issue as weddings considered as a huge celebration in Indian culture</li> <li>Forceful restriction and reduction in celebration only due to COVID restrictions (temporary)</li> </ul>	

#### **6.2 Recommendations to Stakeholders**

Table 6.2 summarises suggested actions for key stakeholders to provide enabling contexts to implement and facilitate lifestyle change options against the obstacles outlined above.

#### Table 6.2 Policy recommendations for key stakeholders

Barriers / Obstacles	Recommendations to Stakeholders			
	Governments	Companies	Civil Society	
Lack of affordable alternatives to meat/ dairy/plant-rich food items	<ul> <li>Investment in sustainable agriculture and organic farming</li> <li>Incentivise organic farming for local farmers</li> </ul>	<ul> <li>Make products more accessible and affordable</li> <li>Participate in community markets, promote organic and vegan products at affordable rates</li> </ul>	<ul> <li>Demand support from government and companies</li> <li>Develop community kitchen gardens in parks and other community spaces</li> <li>Promote organic farming through involvement of local NGOs, and experts</li> <li>Organise local organic markets to increase awareness as well as consumption</li> </ul>	
Lack of public transport infrastructure/Increased dependency on private vehicles	<ul> <li>Investment in E-buses</li> <li>Increased frequency of buses expand capacities of metro coaches</li> <li>Adequate facilities for safety and wellbeing of passengers (particularly women, elderly and disabled)</li> <li>Build infrastructure for cycle-friendly roads</li> </ul>	<ul> <li>Promote carpooling/ride sharing to work</li> <li>Promote usage of public transport to work (e.g. car-free days, teleworking on certain days)</li> </ul>	<ul> <li>Demand supporting measures from Government</li> <li>Promote and organise 'Car Free' days, i.e. certain sections of busy roads are closed for all cars for a particular Sunday of the week</li> <li>Organise other events and campaigns around promoting public transport usage in communities</li> <li>Build more cycle stands in markets/shops/communities with support from Resident Welfare Associations and local municipalities</li> </ul>	
Cultural mind-set (e.g. borrowing of old goods, rented items, second- hand clothes)	<ul> <li>Promotion and integration of thrift shops in mainstream markets</li> <li>Promotion of local businesses focused on supply of second hand/ used goods</li> </ul>	<ul> <li>Support thrift-based initiatives</li> <li>Collaborate with other thrift stores/outlets by selling of discarded/old items at minimal rates, that can then be made available for resale</li> </ul>	<ul> <li>Spread awareness in communities on promoting re-use, repair/recycling of goods</li> <li>Organise thrift markets, and mobilise existing networks/ retailers to participate</li> </ul>	
Lack of housing infrastructure (e.g. rooftop solar, solar heater, sustainable construction materials)	<ul> <li>Infrastructure development for alternative construction materials (e.g. reuse of wood/glass, bamboo)</li> <li>Incentivise installation of rooftop solar infrastructure at affordable rates</li> <li>Build sustainable architecture/design incubation/learning centres</li> <li>Build concrete policies on effectively addressing and dealing with illegal construction activities</li> </ul>	<ul> <li>Promote sustainable architecture and design options</li> <li>Collaborate with sustainable designers/architects in re-looking and redesigning office spaces/industries keeping sustainability at its core</li> </ul>	<ul> <li>Spread awareness around importance of rooftop solar, as well as highlighting long-term benefits</li> <li>Promote small-scale community events with leading experts/designers, focused on the importance and know-how of sustainable construction and architecture</li> </ul>	

# 7. CONCLUSIONS

The current average carbon footprint in New Delhi is below the 1.5 C Lifestyle's 2030 target, however, based on estimated consumption growth in 2030, the average carbon footprint will exceed 2.5tCO<sub>2</sub>/cap/yr. This city scenario for New Delhi presents a vision whereby the target of 2.5tCO<sub>2</sub>/ cap/yr can be achieved, assuming implementation of certain key lifestyle changes. It also seeks to highlight the importance of stakeholders (including the government, businesses and civil society), working in collaboration in order to further strengthen and promote long-term sustainability and lifestyle changes in the city. While Governments can provide necessary supporting measures through systemic policy making and infrastructure building, Businesses can work towards providing more sustainable goods and services. Civil society can also make efforts to promote sustainable lifestyles, particularly within households, and can also play an active role in policy making, holding Governments and Businesses accountable for their respective roles, as well as raising awareness about sustainable lifestyles and low-carbon living. This vision for a more sustainable city can only be achieved through mutual cooperation as well as adequate support from each of the relevant stakeholders.

This scenario not only addresses the quantitative benefits of adopting low-carbon lifestyles, i.e. reduction in individual footprints and GHG emission levels, but also emphasises several qualitative benefits including improved physical and mental health, reduced stress levels, financial stability, improved accessibility, social inclusion and social wellbeing.

## 8. REFERENCES

Aguiar, Angel & Chepeliev, Maksym & Corong, Erwin & McDougall, Robert & Van der Mensbrugghe, Dominique. (2019). The gtap database: Version 10. Journal of Global Economic Analysis. 4. 1-27. 10.21642/JGEA.040101AF.

Boitier, B. (2012) 'CO 2 emissions production-based accounting vs consumption: Insights from the WIOD databases', in WIOD. Available at: http://www.wiod.org/ conferences/groningen/paper\_Boitier.pdf (Accessed: 28 September 2021)

Institute for Global Environmental Strategies, Aalto University and D-mat Ltd (2019) 1.5-Degree Lifestyles: Targets and Options for Reducing Lifestyle Carbon Footprints. Technical Report, Institute for Global Environmental Strategies, Hayama, Japan. Available at: https://www.iges.or.jp/jp/pub/15-degrees-lifestyles-2019/en (Accessed: 28 September 2021).

IPCC (2018). Summary for Policymakers — Global Warming of 1.5 oC. [online] Ipcc.ch. Available at: https://www.ipcc. ch/sr15/chapter/spm/.

Moore, J. L. (2013) Getting serious about sustainability exploring the potential for one-planet living in Vancouver. University of British Columbia. doi: 10.14288/1.0074187. Pathway to Low Carbon City, Delhi. (2009.). [online] Available at: http://www.isocarp.net/Data/case\_ studies/1514.pdf.

Pedalandtringtring (2021). ZOMATO PROMISES CLIMATE CONSCIOUS DELIVERIES. [online] Pedal And Tring Tring. Available at: http://pedalandtringtring.com/2021/04/30/ zomato-promises-climate-conscious-deliveries/

Peters, G. P. and Hertwich, E. G. (2007) 'Post-Kyoto greenhouse gas inventories: production versus consumption', Climatic Change 2007 86:1. Springer, 86(1), pp. 51–66. doi: 10.1007/S10584-007-9280-1.

Rajput, A. (2021). Explained: Delhi's Master Plan 2041, its key areas and challenges. [online] The Indian Express. Available at: https://indianexpress.com/article/explained/ explained-delhis-master-plan-2041-its-key-areas-andchallenges-7352735/

Skymet Weather Team (2015). 6 Major Eco-friendly Steps Taken By Arvind Kejriwal Government In Delhi. [online] www.skymetweather.com. Available at: https://www. skymetweather.com/content/weather-news-and-analysis/6major-eco-friendly-steps-taken-by-arvind-kejriwalgovernment-in-delhi/.

IGES is an international research institute conducting practical and innovative research for realizing sustainable development in the Asia-Pacific region. Inquiries regarding this publication copyright should be addressed to IGES in writing. No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying, recording, or any information storage and retrieval system, without the prior permission in writing from IGES. Although every effort is made to ensure objectivity and balance, the printing of a paper or translation does not imply IGES endorsement or acquiescence with its conclusions or the endorsement of IGES financers. IGES maintains a position of neutrality at all times on issues concerning public policy. Hence, conclusions that are reached in IGES publications should be understood to be those of the authors and not attributed to staff members, officers, directors, trustees, funders, or to IGES itself.

Copyright © 2021 Institute for Global Environmental Strategies.

Institute for Global Environmental Strategies (IGES) 2108-11 Kamiyamaguchi, Hayama, Kanagawa 240-0115 Japan Tel: +81-46-855-3720 Fax: +81-46-855-3702 E-mail: iges@iges.or.jp