Kyoto in 2030

Envisioning 1.5-Degree Lifestyles

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Partner Organisations (Listed in alphabetical order)

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Chulalongkorn University, Thailand
ICLEI Africa, South Africa
Swechha, India

Communications and Outreach Partners
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EXECUTIVE SUMMARY

This report, Kyoto in 2030, recommends some plausible options for 1.5-Degree Lifestyles and measures to support them. This will put society on a path towards realising the globally unified 1.5-Degree Lifestyles target of 2.5 t-CO_2e/capita/year, which is compatible with the Paris Agreement's target of limiting global warming to 1.5°C above pre-industrial levels. Based on an assessment of consumption data across housing, food, mobility, goods, services and leisure, it is calculated that the average lifestyle carbon footprint in Kyoto is currently 7t-CO_2e/capita/year, slightly lower than Japan's national average, but above the global average of 4.3t-CO_2e/capita/year.

Reducing the lifestyle carbon footprint from 7t-CO_2e/capita/year to 2.5 t-CO_2e/capita/year is only feasible through a combination of measures on both the production and consumption side.

Our proposed consumption side measures can reduce Kyoto's average lifestyle carbon footprint from 7t-CO_2e/capita/year to 3.8t-CO_2e/capita/year (-45%), assuming no changes in renewable energy share and no changes in environmental efficiency improvement. We identified 65-actionable lifestyle change options and estimated their potential to reduce carbon footprint based on consumption amounts and energy intensity for production across the housing, food, mobility, goods, services and leisure domains. Selecting options for the 1.5°C Lifestyles is personal, and can vary from one person to another. Through participatory workshops with Kyoto's citizens, the feasibility and desirability of the identified options were evaluated. Workshop participants conducted a two-week household experiment to confirm the viability of the options selected in the workshop. This household experiment enabled the identification of obstacles to implementing the options and what supporting measures are needed to overcome them.

Current average per capita lifestyle carbon footprint in Kyoto	7t-CO_2e/capita/year
2030 average per capita lifestyle carbon footprint in Kyoto after lifestyles change with assuming no improvements in renewable energy share and environmental efficiency from the current level	3.8t-CO_2e/capita/year
2030 average per capita lifestyle carbon footprint in Kyoto after changes in lifestyles with assuming improvements in both renewable energy share and environmental efficiency	2.5 t-CO_2e/capita/year

In Kyoto, the housing domain accounts for the maximum carbon footprint, followed by food, mobility, goods, services and leisure. For housing, the high carbon intensity of the energy matrix accounts for the maximum carbon footprint. Reducing dependency on an energy matrix with a higher intensity is crucial. For businesses and governments, making low-carbon energy readily available is a key area for intervention. For citizens, subscribing to green energy, when available, or installing rooftop solar PVs are possible options that have maximum carbon footprint reduction potential. Many workshop participants expressed interest in installing rooftop solar PVs, if simplified cost benefit analysis and financial assistance for installation is available. Other measures, such as installing LED lighting and adjusting clothing to indoor temperatures to reduce artificial cooling and heating, are the most feasible options in the short term, according to workshop participants.

Some of the 65 lifestyle change options, particularly related to low-carbon mobility and conscious consumption of goods are already being promoted by the Kyoto City Government and multi-stakeholder initiatives such as the 'Do You Kyoto' campaign. Hence, this policy report strengthens some of the existing efforts by connecting them with other options for a low carbon lifestyle. It also provides a comprehensive guide to accelerate the transition towards carbon neutrality by 2050. Through group discussions between the authors and citizens, it was confirmed that 1.5°C Lifestyles can have multiple co-benefits in addition to limiting global warming. Some of the co-benefits include revitalisation of local economies, strengthened communities, reduction of air pollution, and creation of vibrant neighbourhoods, potentially leading to a better quality of life.

Citizens identified various obstacles to implementing these 1.5°C Lifestyles options, including a lack of infrastructure, products and services; limited awareness about existing infrastructure, and products and services; high costs to implement some options; low accessibility; conflicts with personal needs; conflicts with other people's needs; and conflicts with societal norms. It was realised that lifestyle changes cannot be achieved without systemic changes. Supportive measures by government and business can enable households to implement the recommended options for effective transition to the 1.5°C Lifestyles, and conversely awareness and willingness of households to take action can encourage government and business to provide supporting measures.

However, to realise 1.5°C Lifestyles compatible with the 1.5°C climate goal, both production and consumption measures are necessary. For example, if the share of renewable energy reaches 53% and annual environmental efficiency improvement is maintained at 3% up to 2030, the proposed consumption measures could achieve the goal of 2.5 t-CO_2e/capita/year (-64%). Based on existing initiatives in Kyoto and across Japan, it is expected that contributions to reduce carbon footprint are not limited to renewable energy increase and improvements in environmental efficiency, but also involve other production side changes like the digital transformation, artificial intelligence, acceleration in autonomous and shared mobility, reduction in material consumption, and advances in robotics.

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 Kyoto. Citizens' carbon footprints are highly variable, corresponding to differences in income, occupation, age, family structure and health. The report argues that it is vital to reduce the average lifestyle carbon footprint of citizens below the 2030 target (2.5tCO_2e/yr per person). 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.

This report accentuates that a 1.5°C Lifestyle of 2.5 t-CO_2e/capita/year target is very ambitious but can be achieved if all the stakeholders take adequate action in a collaborative manner. It aims to provide ideas for a diverse range of citizens towards realising 1.5°C Lifestyles, while noting that adoption rates are just indicative figures, and are not future projections or targets.

CONTENTS

1. INTRODUCTION

Current climate debates largely focus on production-based strategies to reduce carbon emissions. Production-based accounting covers direct emissions from domestic production activities within geographical boundaries and offshore activities under the control of a country, 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 carbon leakage in production-based strategies and promotes comprehensive mitigation options while not burdening developing countries with excessive emissions obligations (Peters and Hertwich, 2007).

The analysis of individual lifestyles offers the possibility of a comprehensive assessment of consumption-related carbon emissions in different areas of life such as housing, food, mobility, goods, services and leisure, as well as the links between these areas (Institute for Global Environmental Strategies, Aalto University and D-mat Ltd, 2019). Lifestyle carbon footprints can be assessed through national or city boundaries. Given the availability of consumption data, the city where an individual resides provides appropriate geography to account for carbon emissions across production, distribution, use, and disposal of purchased products and services including those embedded in trades.

This scenario provides recommendations on how to substantially reduce consumption-based carbon emissions through the 1.5°C Lifestyles, developed in consultation with the citizens of Kyoto, who were selected by IGES based on their existing network and practical considerations for project implementation. This scenario accentuates that the adoption of a low-carbon lifestyle options relies on supporting measures by governments and businesses to facilitate individual efforts, and emphasises the importance of collaborative efforts by all stakeholders.

1.1 Background

Kyoto city is the former capital of Japan and home to over 1.4 million people. The city is the capital of Kyoto prefecture, located in the western region of Japan, and it is one of the major metropolitan areas in the country. The median age of residents is 45.6 years (Government of Japan, 2021b). The city is also famous as a global tourist destination. In 2019, the maximum number of tourists recorded in one month was as high as 4.94 million, whereas the annual number of tourists was 87.91 million. Along with tourism, Kyoto's economy is driven by manufacturing companies. In recent years, the city is promoting support for start-ups, particularly across IT, Life Sciences, Internet of things, Artificial Intelligence, Robotics, and Mobility (JETRO, 2021).

Kyoto has a long history of being a leader in addressing global warming. From hosting the Conference of Parties in 1997 that resulted in the Kyoto Protocol, to organising the Kyoto Conference on the Global Environment in 2017 (KYOTO+20), it has underscored the responsibilities of cities, as major emitters of greenhouse gases, to achieve net-zero carbon emissions, and the need to act at all levels of governance to realise the Paris Agreement (Kyoto City, 2019). The Prime Minister of Japan's Eco-Model City Initiatives launched in 2008 selected Kyoto to reduce 40% of its carbon emissions by 2030 and 60% by 2050 as compared to the 1990 baseline (Gudmundsson et al., 2016). Under this initiative, 'Pedestrian-centered urban

planning'; 'Low-Carbon Building and Use of Local Materials'; and 'Kyoto Model Lifestyle' are some of the key thematic areas (Government of Japan, 2021a). These thematic areas have synergies with some of the lifestyle options proposed in this scenario. For example, walking or biking for commuting, and living in low-carbon, carbon neutral, or carbon positive housing.

In 2019, Mayor Daisaku Kadokawa further accelerated efforts on carbon emission reduction by announcing the city's long-term strategy to pursue measures and take concrete actions towards achieving carbon neutrality by 2050 (Kyoto City, 2019) at the commemorative symposium of the IPCC Session in Kyoto, jointly held by the Ministry of the Environment Japan, the Institute for Global Environmental Strategies (IGES) and ICLEI Japan.

In line with the efforts of the national and local government, citizens of Kyoto are equally keen to take action towards a decarbonised future. As part of a multi stakeholder initiative among the government, citizens and businesses, the 'Do you Kyoto' campaign encourages citizens to use public transport, and reduce electricity usage and private cars on the 16th day of every month. Businesses like Shinzaburo Ichizawa Co., Ltd and Miyai Co., Ltd, support this initiative by developing reusable bags and Furoshiki to reduce the use of plastic bags (Do you Kyoto? Network, 2021).

To summarise, Kyoto has many ongoing initiatives to reduce carbon emissions through production and consumption-based carbon emission reduction strategies. Policymakers, citizens and businesses are exhibiting a strong will to transition towards a decarbonised future. This scenario augments the existing initiatives by illustrating a comprehensive set of options across housing, food, mobility, goods, services and leisure for lifestyle carbon footprint reduction.

1.2 The Scenario

Co-created with citizens, this scenario—Kyoto in 2030—recommends options and their supporting measures to reduce lifestyle carbon footprint and towards realising 1.5°C Lifestyles that are defined as sustainable lifestyle, compatible with the 1.5°C Target of the Paris Agreement to limit global warming to 1.5°C above pre-industrial levels. The lifestyle carbon footprints targets are set at 2.5 t-CO_2e/capita by 2030, 1.4 t-CO_2e/capita by 2040, and 0.7 t-CO_2e/capita by 2050 (Institute for Global Environmental Strategies, Aalto University and D-mat Ltd, 2019). This scenario focuses on the 2030 target.

Choice of a decarbonised lifestyle is personal, and can vary from one person to another, hence it is crucial to select low-carbon lifestyle options across housing, food, mobility, goods, services and leisure that suit individual preferences and needs. Before considering specific lifestyle options, it is necessary to benchmark an individual carbon footprint, and identify hotspots for footprint reduction across housing, food, mobility, goods, services and leisure domains. Analysis of Kyoto citizens' average lifestyle carbon footprint and its related hotspots provides both policymakers and citizens with an indicative carbon footprint benchmarking, and a hotspot analysis along with 65-actionable lifestyle change options, specific to Kyoto's culture and social economic context. These options are also in line with a conceptual city vision, developed based on a participatory workshop about the desired future of the city and lifestyle. Preferences made by citizens in terms of these 65-options are indicated through the adoption rate of these options. Most of the options were implemented by project participants, either before or during the two-week household experiment. Through implementation, they were able to identify the obstacles and the required supporting measures from government and businesses to effectively mainstream the decarbonised lifestyles options. Thus this policy report aims not only to encourage citizens to make environment-friendly choices every day but also to solicit actions to other stakeholders including the government and the business sector to enable and facilitate citizens to make such choices. In other words, our objective is not only to inspire citizens, governments and business to embrace and promote conscious living, but also to broaden the narrative of taking action from policymakers to every citizen and resident of Kyoto despite their age, gender, nationality or socio-economic status.

The next section details the methodology involved in developing this scenario. Section 3, 4, and 5 introduce the project findings of average baseline carbon footprint in Kyoto, desired future city vision, and low-carbon lifestyle options across 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 transition towards a 1.5-Degree Lifestyles (1.5°C Lifestyles).

2. METHODOLOGY

For co-creating the scenario, a twofold research method was deployed, involving quantitative analysis and a participatory consultative process. The key steps under each of these methods are elaborated below.

2.1 Quantitative Analysis

The quantitative analysis is used to (i) calculate Kyoto's baseline carbon footprint; (ii) identify lifestyle carbon footprint reduction hotspots; and (iii) estimate the potential of low-carbon lifestyle options when adopted in tandem. More details of quantitative methodology and data sources of the analysis of Japanese cities have been set out previous studies (Koide et al., 2021).

Step 1: Calculation of Kyoto's Average Carbon Footprint

- Carbon footprint calculation takes into account the consumption amount and energy intensity for production of different items across housing, food, mobility, goods, services and leisure domains.
- For Kyoto, the average carbon footprint was calculated by aggregating carbon footprints of about 522 lifestyle items, based on 2015 reference data.
- The greenhouse gas intensity data was obtained from the 2015 embodied energy and emission intensity data for Japan using input–output tables (3EID) (Nansai et al., 2012, 2020).
- The monetary-based consumption amount and intensity data were hybridised to incorporate physical units of consumption considering the local price information.

Step 2: Hot Spot Analysis

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

- Taking a closer look at each domain enabled identification of carbon footprint hotspots. Here, hotspots mean the individual lifestyle items that have either a high consumption amount or a high carbon intensity in production, or both of these.

- Hotspot analysis helps to identify lifestyle options that have maximum potential to reduce carbon footprint.

Step 3: Development of Lifestyle Carbon Footprint Reduction Options

- Through analysis of carbon footprint hotspots for each domain and following a systematic literature review, 65 lifestyle carbon footprint reduction options were identified.

- These options were graphically illustrated along with their carbon footprint reduction in an options catalogue. The options catalogue provided simplified communications tools.

- The carbon footprint reduction potential of the 65-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 of shifting car commute to other low-carbon mobility means. The aggregated reduction effects of implementing multiple options were estimated by taking into account their interactions. Accounting for interactions resulted in substantially smaller carbon footprint reduction potentials than a simple summation of the reduction potential of each option.

2.2 Participatory Consultative Process

This process aims to reflect citizens' ideas and opinions to co-create the scenario. Both the first and second workshops were held online in collaboration with the Science Communications Research Institute Japan (SCRI). SCRI helped in recruiting the participants and also moderated the workshops. A baseline questionnaire survey was conducted to compare Kyoto's average lifestyle carbon footprint calculated through quantitative analysis, and the actual footprint indicated by the participants.

Step 1: Online Workshop 1

The first workshop was held online in November 2020 with 29 participants. The participants were presented with information on climate change and how everyday changes in consumption can affect global warming, then the following sessions were conducted:

- The participants were asked to share their vision for Kyoto city in 2050. This enabled them to identify lifestyle carbon footprint options that were most in line with the collective long-term city vision held by other participants.

- The participants were then asked to select lifestyle carbon footprint reductions that would be feasible for an average person in Kyoto along with their adoption rate[1].

- Among the 65-lifestyle carbon footprint reduction options, 63 were selected by the workshop participants.

- The participants were given a detailed explanation of the household experiment, including a two-week trial, followed by a two-week actual experiment. The participants were provided with recording sheets in the form of a 'household experiment notebook' and were informed about how to carry out the recording.

Step 2: Household Experiment

Initially it was planned that authors will visit the households and interview participants during the household experiment. However, this was not possible due to restrictions because of the Covid-19 pandemic. Instead, follow ups were made online and through phone calls. 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.

- Before starting the household experiment, the participants were asked to select the current status of all 65 carbon footprint reduction options and the options that they plan to practice during the experiment.

- The household experiment notebook which was given to the participants during workshop 1, consisted of three parts: 'preparation and planning', 'implementation' and 'summary'.

1 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.

- Preparations and planning: The participants were asked to write freely about the preparations they made for the experiment (e.g. searching for a shop where they could buy vegan food, discussing it with their family).

- Implementation: The participants were asked to report the degree of daily implementation (100%, 75%, 50%, 25%, 0%, etc.) of the chosen option during the two-week implementation period.

- Summary: The participants were requested to provide a self-assessment of the whole experiment for the options practiced. They were also asked to write freely about any difficulties or obstacles in adopting the option and what kind of support or social changes would help to increase the adoption rate of each mitigation option.

Step 3: (Online Workshop 2)

- The second online workshop was attended by 23 participants.

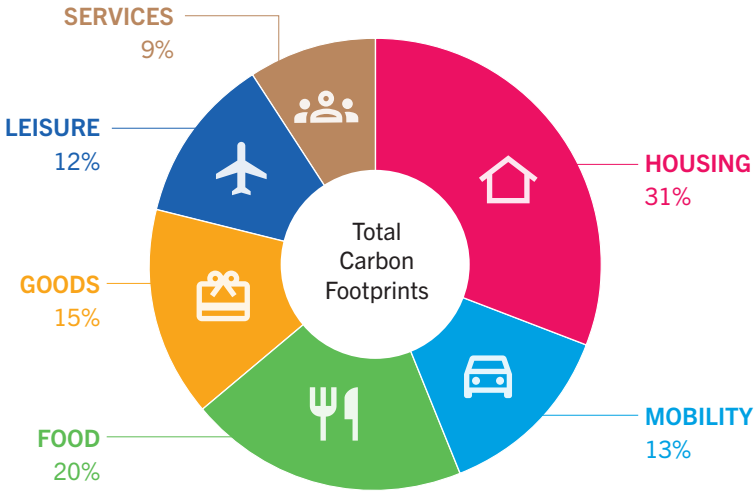
- Authors presented project findings on the city vision, feasibility of lifestyle carbon footprint reduction options and the supporting measures that will enable citizens to effectively implement these options.

Findings from the quantitative analysis and participatory consultative process are elaborated further in sections 3, 4, 5 and 6.

3. OVERVIEW of BASELINE DATA

Kyoto's average baseline carbon footprint was calculated as 7.0 t-CO_2e based on input-output analysis together with mixed-unit consumption data. The city's average baseline carbon footprint is slightly lower than Japan's national average of 7.1 t-CO_2e (Koide et al., 2021), but much higher than the global average of 4.3 t-CO_2e (OECD, 2020).
In estimating the carbon footprint, six lifestyle domains—housing, food, mobility, goods, services and leisure, accounting for 75% of consumption-based emissions—were considered. Among the six domains, it was found that in Kyoto, the housing domain has the maximum carbon footprint, followed by food, goods and mobility. Each of these domains was analysed in further detail to identify hot spots for carbon footprint reduction. Figure 3.1 presents a systematic breakdown of the average baseline footprint.

Figure 3.1 Distribution of carbon footprint in six domains



3.1 Housing

Kyoto's housing typology comprises traditional 'Machiya' houses, apartment buildings and newly constructed individual houses. In the housing domain, household electricity consumption accounts for the maximum per capita carbon footprint due to both high carbon intensity of energy matrix and high consumption amount.

Figure 3.2 Hotspot analysis in Housing domain

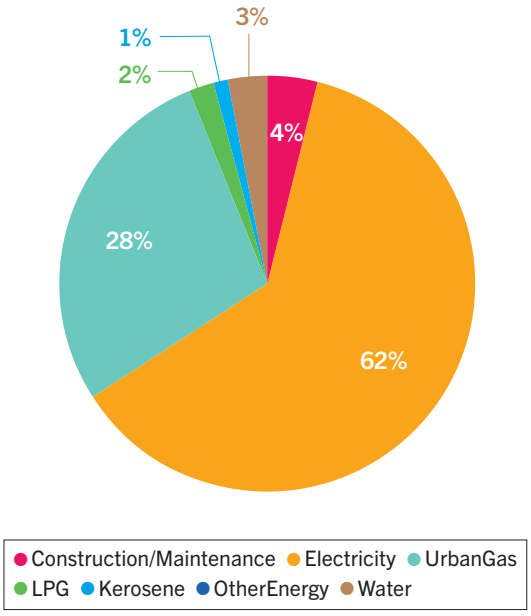
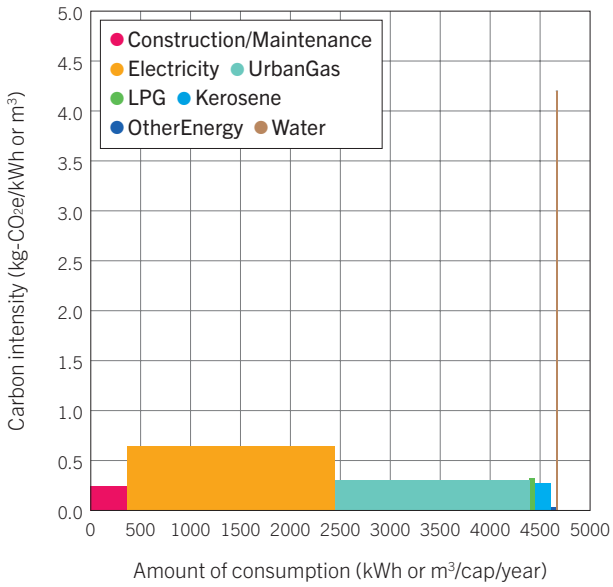


Figure 3.3 Carbon intensity and consumption amount in Housing domain



3.2 Food

Kyoto's traditional cuisine prepared with locally produced ingredients is famous across Japan, particularly specialities like Kaiseki-ryōri and Shojin Ryori (traditional vegetarian dishes). However, the food domain has the second highest carbon footprint. Non-local sourcing of cereals, vegetables, high consumption of packaged beverages, and energy-intensive production of red meat contributes to a high carbon footprint.

Figure 3.4 Hotspot analysis in Food domain

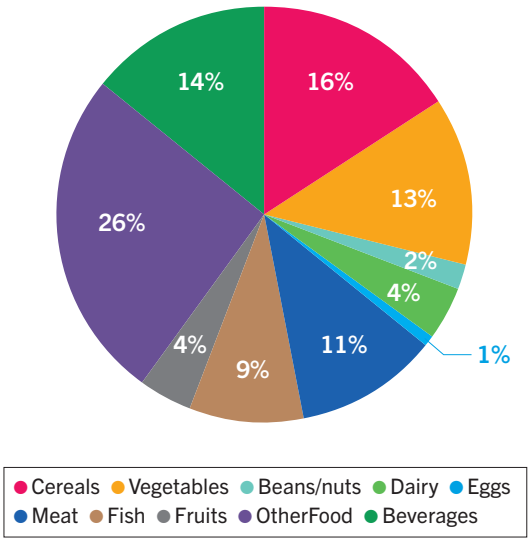
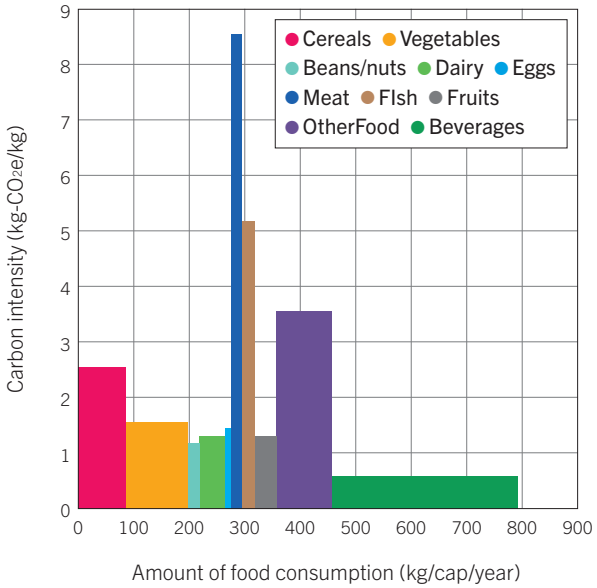


Figure 3.5 Carbon intensity and consumption amount in Food domain



3.3 Mobility

Kyoto has an integrated public transport system with trains, subways and buses. However, the capacity of these transport systems are overwhelmed due to tourism. Mobility domain's carbon footprint is mainly due to the usage of conventional internal combustion engine (ICE) powered cars.

Figure 3.6 Hotspot analysis in Mobility domain

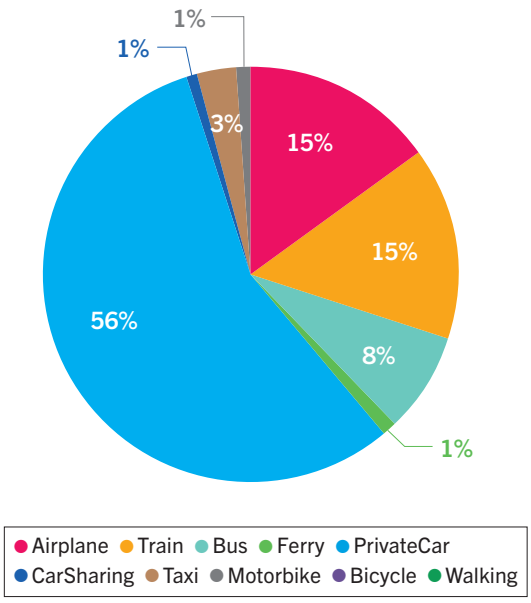
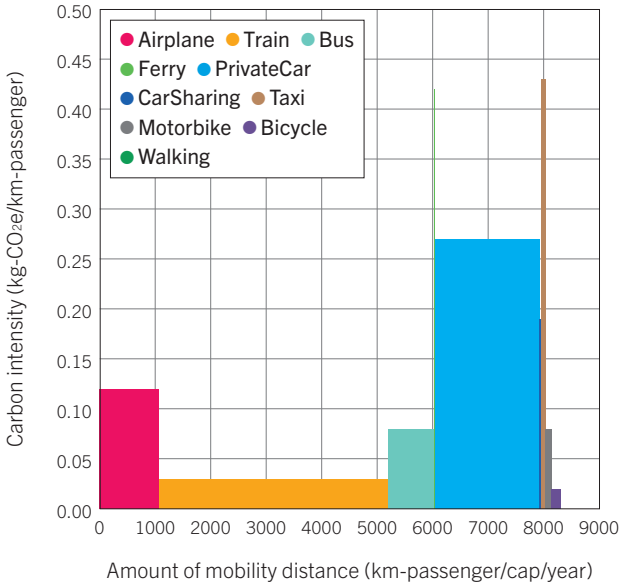


Figure 3.7 Carbon intensity and consumption amount in Mobility domain



3.4 Goods, Services and Leisure

A key challenge in the good's domain is purchase and disposal of clothes. The carbon footprint in the services domain is mainly due to parcel delivery.
Leisure's carbon footprint is primarily due to eating-out and long-distance tourism.

Figure 3.8 Hotspot analysis in Goods domain

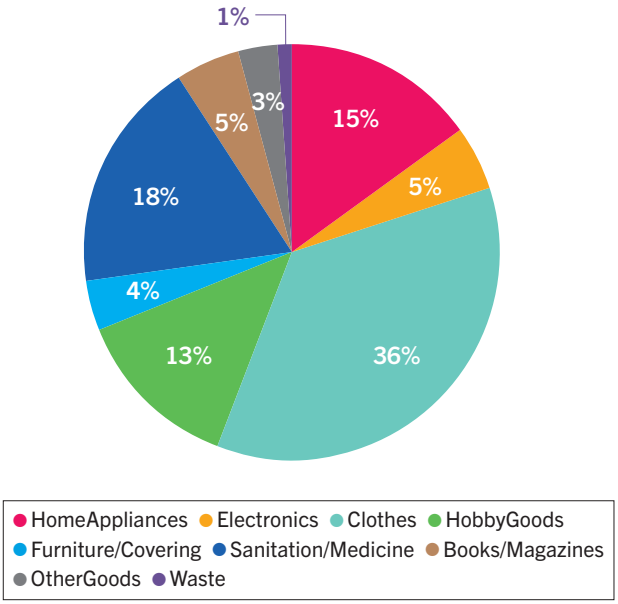


Figure 3.9 Carbon intensity and consumption amount in Goods domain

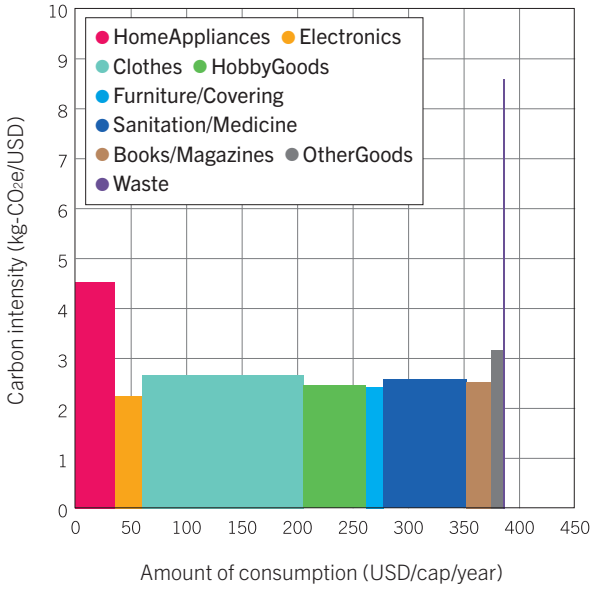


Figure 3.10 Hotspot analysis in Service domain

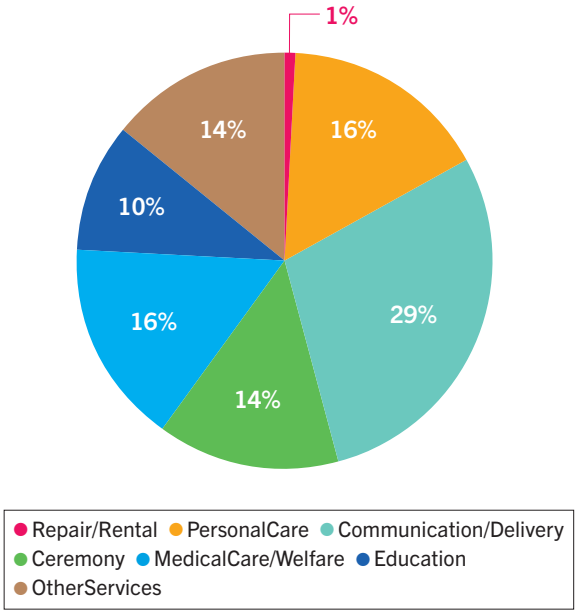


Figure 3.11 Carbon intensity and consumption amount in Service domain

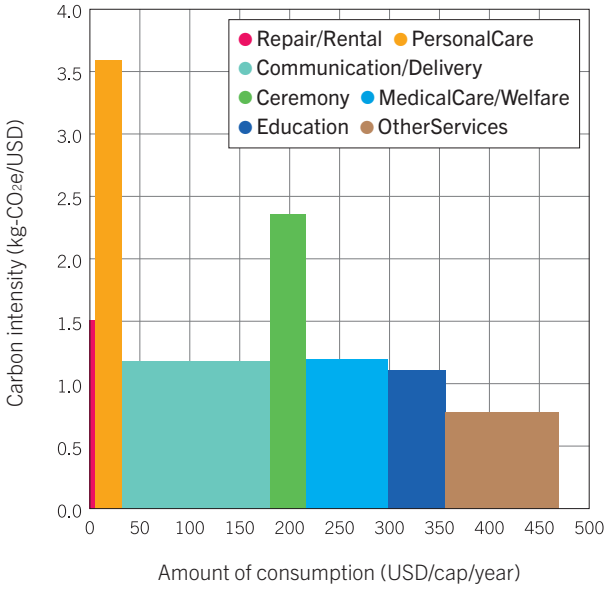


Figure 3.12 Hotspot analysis in Leisure domain

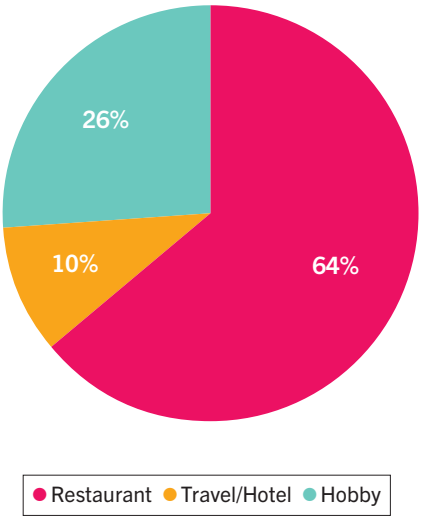
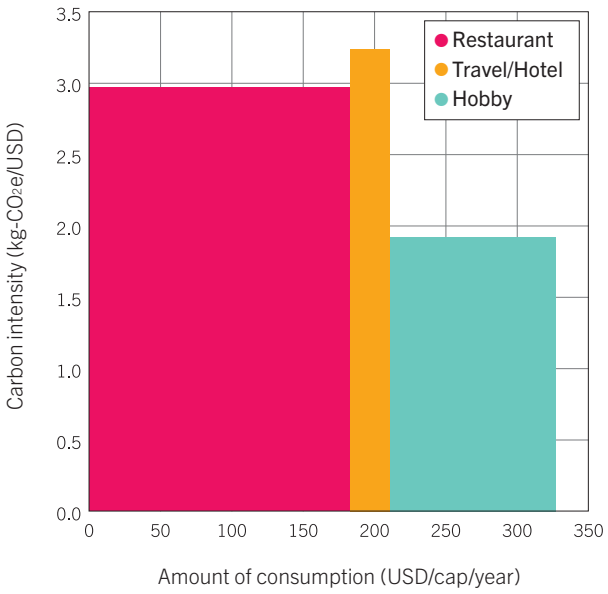


Figure 3.13 Carbon intensity and consumption amount in Leisure domain



4. CITY VISION

- Based on the vision discussion at the first workshop, three key themes were identified for Kyoto's future city vision: transport, landscape and culture.
- Future lifestyles to realise the 1.5°C target could be realised by re-evaluating and further developing Kyoto's traditional lifestyles, which can be represented, in a nutshell, as 'self-sufficiency in moderation'.

4.1 Development of City Vision

The city vision towards 2050 was developed to provide a future direction for a 1.5°C Lifestyle that aims to simultaneously achieve a good quality of life and major mitigation of the carbon footprint. The year 2050 was selected for an envisioning exercise to enable the workshop participants to come up with truly sustainable futures that were not restricted by existing systemic lock-ins. A text analysis was conducted to gain insights from participants' opinions on "What of Kyoto city shall be retained towards 2050" and "What of Kyoto-city needs to be improved towards 2050" shared during two workshops.

The analysis of opinions on "What of Kyoto-city shall be retained towards 2050" highlighted that the participants were aware of and expressed a strong desire to maintain the traditional culture. Specifically, there was a strong interest in preserving traditional streetscapes and traditional architecture such as the Kyoto 'Machiya', the traditional wooden townhouses that were often used by Kyoto merchants and craftspeople in the past. There was also a strong rejection of traffic congestion caused by cars in the city, which is not a response to the question, but represents a form of civilisation that may threaten the preservation of traditional culture. Therefore, there was a strong interest in the use of bicycles as an alternative to cars, and specific policies such as the construction of bicycle lanes were proposed as a policy instrument. In terms of traditional culture, participants also emphasised the importance of Kyoto's food culture. Kyoto cuisine, which uses traditional Kyoto vegetables, is the embodiment of local production for local consumption, and participants were keenly aware that preserving this food culture is directly linked to a low-carbon lifestyle.

As an extension of the discussion during the "What needs to be improved towards 2050" session, the negative effects of cars were widely discussed, not only in terms of traffic congestion, but also in terms of harmony with the cityscape and traffic safety. Tourism is a major source of income for Kyoto, thereby contributing to maintaining its traditional culture, but the problem of tourism pollution caused by the excessive influx of tourists was also raised. In relation to the car problem and tourism pollution, the public transport system was also discussed. Although it was rated as 'adequate' in the "What shall be retained" session, the participants recognised that it needed to be further improved to accommodate the above car and tourism problems.

Figure 4.1 Analysis of what workshop participants wish to be improved in Kyoto towards 2050

4.2 Key Themes of the City Vision towards 2050

The above mentioned analysis extracted the following three key themes: transport, landscape and culture. Major issues found under these three themes are summarised below along with their possible solutions. It was observed that issues related to 'traffic' are a major threat to Kyoto's unique historical landscape and culture.

Theme 1: Transport (tourist pollution, public transport, bicycles)

Issues or Requests	Solutions (example)
Many cars Congestion due to tourism	Shift to public transport (e.g. restrictions on car access)
Lack of adequate public transport	Promotion of teleworking Shift to walking and cycling (e.g. the construction of bicycle paths)

Theme 2: Landscape (streetscape, telephone poles, Kyoto 'Machiya', nature, parks)

Issues or Requests	Solutions (example)
Too many buildings (hotels)	Landscape regulations, building regulations (agreements)

Issues or Requests	Solutions (example)
The traditional townhouses (Kyoto 'Machiya') being destroyed	Building Preservation (Grants for renovations)
Electricity poles obstructing traffic	Undergrounding of power lines
Nature (green space) disappearing	Maintenance of street trees, tree planting and multipurpose parks (e.g. promotion of nearby recreational activities)
Parks are not convenient or comfortable to visit	Multi-purpose parks (e.g. promotion of nearby recreational activities)

Theme 3: Culture (traditional architecture, cultural heritage, food)

Issues or Requests	Solutions (example)
Want to preserve traditional architecture	Assistance for the conservation of traditional architecture
Want to preserve our cultural heritage	Assistance for the conservation of cultural assets
Want to preserve our food culture	Promote local production for local consumption
Want to preserve our distinctive atmosphere	Revitalisation of local shopping streets (e.g. compact city)

4.3 Summary of Future City Vision

The above-mentioned participatory process confirmed that many participants in Kyoto city had a keen sense of ownership in their city's traditional culture. In addition, many participants were aware that a return to traditional lifestyles would greatly contribute to lifestyle change necessary to move towards '1.5℃ Lifestyles'.

The traditional lifestyle in Kyoto can be represented as 'self-sufficiency in moderation', namely consciously controlling consumption, reasonable to one's personal needs in terms of their feelings, habits, livelihoods etc. that also lies within reasonable limits.

Over a period of more than 1,200 years, the citizens of Kyoto have slowly developed the skills necessary to live in harmony with their natural environment in a sustainable way.

These skills have resulted in an exceptional urban landscape comprising temples and 'Machiya' houses, and a unique culture of Kyoto vegetables based on urban agriculture. In this context, it is the future vision of Kyoto to continue to develop the technologies that have been cultivated so far, and which will lead to 1.5℃ Lifestyles for those who live in Kyoto.

In addition, these landscapes and cultures have become important tourist resources, making Kyoto one of Japan's leading tourist cities. However, this has also led to tourism pollution, particularly from traffic. Measures are needed to reduce tourism pollution such as diversification of attractive sites and activities along with better coordination of various modes of transportation.

Illustration: Tania Vicedo

5. LIFESTYLE CHANGE TOWARDS 2030

- The identified lifestyle carbon footprint reduction options and their adoption rates can reduce lifestyle carbon footprint by 3.2 t-CO_2e/capita/year (from 7.0 to 3.8 t-CO_2e/capita/year) (-45%), assuming no change to renewable energy share and no change in environmental efficiency improvement by 2030.

- To achieve the 1.5°C Lifestyles' carbon footprint target of 2.5 t-CO_2e/capita by 2030, in line with the Paris Agreement, both consumption and production side measures are needed. For example, if the scenario assumes transformative production side changes such as the share of renewable energy share reaching 53% and the 3% annual environmental efficiency improvement will be maintained up to 2030, then the proposed consumption side measures could achieve the goal of 2.5 t-CO_2e/capita/year (-64%).

- Production side measures include an increase in renewable energy supply, improvement of environmental efficiency, as well as other factors like digital transformation, artificial intelligence, acceleration in autonomous and shared mobility, reduction in material consumption and robotics, and these can all contribute to achieving the 2030 reduction target to enable sustainable lifestyles.

- In the major consumption domains, substantial footprint reductions can be realised in housing (-83%), mobility (-77%), leisure (-58%) and goods (-56%).

- Food and service domains are areas where it is relatively difficult to reduce carbon footprint.

- Adoption of the proposed lifestyle changes are expected to generate various co-benefits such as economic benefits through reduced operation costs (e.g. less energy expenditure) or reduced consumption expenditure, health benefits (e.g. shifting from car to bicycle, increasing plant-based diet), and more appreciation of local landscape as a result of active mobility and local tourism.

- The proposed lifestyle changes may require changes in our value system such as a shift in priority from material abundance to satisfaction with a sustainable way of living.

- The proposed lifestyle change options are suggestions, and it is assumed that they will be implemented if citizens show willingness and the appropriate situations are enabled.

5.1 Lifestyle change options and adoption rates

There are three main approaches for reducing a lifestyle carbon footprint: energy efficiency improvement, modal shift, and absolute reduction (Institute for Global Environmental Strategies, Aalto University and D-mat Ltd, 2019). In this scenario, they are defined as follows:

- Energy efficiency improvement: Decreasing emissions by replacing technologies with lower-carbon ones with no change in the amount consumed or used, such as energy-efficient lights, appliances and vehicles.
- Modal shift: Shifting from one consumption mode to a less carbon intensive one, such as adopting a plant-based diet, using public transport, or using renewable energy for electricity or heating.
- Absolute reduction: Reducing physical amounts of goods or services consumed, such as food, kilometres driven, energy use or living space.

Sixty-five (65) options for lifestyle carbon footprint reduction were presented at the first workshop, and participants were asked to select options considering their reduction potential and potential contribution to the City Vision. The selected options in the Kyoto scenario are listed in the following tables (Tables 5.1-5.4), with their respective maximum carbon reduction potential[2] (assuming 100% adoption rate) and preferred adoption rates by the citizens in 2030.

Selection of certain options influenced the carbon footprint reduction potential of other options. In such cases, adjustments were made to identify the aggregated mitigation potential[3], for example, implementing both teleworking and shifting from private car commuting to bicycles will reduce mitigation impacts of the latter as the former reduces commuting distance.

For the housing domain, Table 5.1 shows the selected options. Relatively easy options such as installing LED lights and regulating temperature by clothing are widely adopted. Electricity generation by rooftop solar PV is desired, but a potential conflict with traditional architecture, cityscape and landscape could hinder the promotion of this option further. In this regard, efforts are needed by government and business sector stakeholders to provide houses with solar PV that are compatible with traditional landscapes.

Table 5.1 Selected housing related options

Name of Housing Related Option	Carbon footprint reduction potential ($kgCO_2e$/capita/yr)	Adoption rate in 2030 (%)
LED Lighting	92	80
Regulate Temperature by Clothing	112	75
Room Heating by Air Conditioner	114	55
Improvement of Window for Insulation	46	50
Nudge for Energy Saving	59	50
Hot Water Supply by Heat Pump (Eco Cute)	121	30
Compact House Living	235	30
Nearly Zero Energy House	1,433	28
Renovation for Insulation Improvement	142	25
Hot Water Supply by Solar Water Heater	183	20
100% Renewable Grid Electricity	1,232	19.6
Electricity Generation by Solar PV and IH Cooking Heater	1,352	15
Electricity Generation by Solar PV	1,275	15

2 Mitigation potential indicates the maximum carbon footprint reduction potential if the referent option is adopted 100% without taking account interaction with other options.

3 When multiple options are implemented simultaneously, we need take into account interactions among options.

Name of Housing Related Option	Carbon footprint reduction potential ($kgCO_2e$/capita/yr)	Adoption rate in 2030 (%)
Life Cycle Carbon Minus House	2,086	11.2
Zero Energy House	1,815	11.2

For Food, Table 5.2 shows the selected options. Many citizens can make efforts to reduce food loss both at home and at restaurants, and will follow a food balance guide to ensure a healthy diet. Many citizens can purchase seasonal local vegetables, and vegetarian dishes will be more popular, consistent with the City Vision, and a unique culture of Kyoto vegetables based on urban agriculture.

Table 5.2 Selected food related options

Name of Food Related Option	Carbon footprint reduction potential ($kgCO_2e$/capita/yr)	Adoption rate in 2030 (%)
Food Loss Reduction at Home	37.0	60
Food Loss Reduction at Restaurants	17.2	60
Drinking/Eating Snack Healthy following Food Balance Guide	126.1	55
Cooking Healthy following Food Balance Guide	42.6	50
Eating Seasonal Vegetables (Seasonal Food)	35.9	50
Eating Local Vegetables (Local Food)	7.9	50
Healthy Lifestyles by Reducing Tobacco and Alcohol	162.2	35
Shifting from Traditional Meat to Alternative Meat	186.4	30
Buying Healthy Ready Meals following Food Balance Guide	16.6	25
Eating Out Healthy following Food Balance Guide	26.6	25
Plant, Egg and Dairy-based Diet (Vegetarian)	219.8	20
Shifting from Red Meat to Chicken (White Vegetarian)	70.4	20
Plant-based Diet (Vegan)	341.2	10
Shifting from Meat to Seafood (Pescatarian)	73.6	5

For Mobility, Table 5.3 shows the selected options. Private car usage both for commuting and other trips can be substantially reduced. Moreover, most conventional cars can be replaced by various eco-cars such as electric vehicles and plug-in hybrid vehicles. The volume of road transportation can be further reduced as ride-sharing and car-sharing become common, and much less car traffic could enable better bus services and a safer environment for bicycle users. Many citizens can take actions to reduce high emissions from long distance travels by shifting transportation modes or by reconsidering closer travel destinations.

Table 5.3 Selected mobility related options

Name of Mobility Related Option	Carbon footprint reduction potential ($kgCO_2e$/capita/yr)	Adoption rate in 2030 (%)
Eco Driving	148.1	60
Less Frequency of Shopping	144.8	55

Name of Mobility Related Option	Carbon footprint reduction potential ($kgCO_2e$/capita/yr)	Adoption rate in 2030 (%)
Telework	279.4	50
Online Home Coming Visit	170.4	45
Domestic Vacation	57.2	45
Shifting from Long Distance Driving to Train	278.1	40
Car Sharing	212.7	40
Shifting from Car to Bicycle (other than commuting)	466.3	39.6
Ride Sharing	510.2	35
Electric Vehicle	242.3	35
Shifting from Commuting by Car to Bicycle	221.8	32.1
Living Close to Work	191.3	30
Shifting from Domestic Flight to Train	40.7	30
Shifting from Car to Bus (other than commuting)	328.4	28.8
Shifting from Commuting by Car to Bus	154.5	25.0
Local Weekends and After Work	96.9	25
Shifting from Long Distance Driving to Bus	208.8	25
Electric Vehicle with 100% Renewable Energy	467.4	25
Shifting from Car to Train (other than commuting)	435.9	21.6
Shifting from Taxi to Bus and Bicycle	18.3	20
Shifting from Commuting by Car to Train	205.1	17.9
Local Vacation	151.8	15
Plug-in Hybrid Vehicle	244.7	15
Plug-in Hybrid Vehicle with 100% Renewable Energy	379.9	10
Light Vehicle	126.5	10

For goods, services and leisure, Table 5.4 shows the selected options. Longer use and recycling of clothes is particularly popular, and other goods are also carefully selected for longer use or for being recycled. Participating in community recreational activities and community eco-tourism is also very common, and this will contribute not only to enhance social capital but also to provide diversified tourism options that will mitigate tourism pollution.

Table 5.4 Selected goods and leisure related options

Name of Goods and Leisure Related Option	Carbon footprint reduction potential ($kgCO_2e$/capita/yr)	Adoption rate in 2030 (%)
Longer Use and Recycling of Clothes	193.7	70
Longer Use and Recycling of Bags and Jewelleries	31.9	55
Longer Use and Recycling of Electrical Equipment	44.6	50
Longer Use and Using Up of Consumables	90.1	50

Name of Goods and Leisure Related Option	Carbon footprint reduction potential (kgCO_2e/capita/yr)	Adoption rate in 2030 (%)
Sharing of Books and Magazines	18.9	50
Longer Use and Recycling of Furniture and Carpets	7.9	50
Longer Use and Recycling of Hobby Goods	162.2	35
Participate in Community Recreation Activities	186.4	30
Participate in Community Eco Tourism	16.6	25

It should be noted that the proposed lifestyle carbon footprint reduction options will be implemented by citizens who are willing to implement them, and who are also in an enabling situation. The scenario recommends lifestyle change options, while acknowledging that the choice to commit to a 1.5°C Lifestyles is personal, and can vary from one person to another depending on their age, physical condition, occupational situation, family composition, as well as access to public transport and shopping areas. It may also depend on a person's value judgement. Moreover, the proposed adoption rates imply that this scenario should not be interpreted as being prescriptive for all citizens. The adoption rates are just indicative figures embedding the expectations and feasibility assessments in 2030 held by workshop participants hence it should not be interpreted as future projections or targets.

5.2 Change in lifestyle carbon footprints

The proposed lifestyle change options can reduce the per capita lifestyle carbon footprint from the current 7.0 t-CO_2e/year to 3.8 t-CO_2e/year, assuming there is no change in renewable energy share or in carbon footprint intensity by 2030. However, it is assumed that by 2030, the target year of this scenario, many baseline conditions that are used to estimate the carbon footprint will change. Various parameters on the production side including the change in renewable energy supply, improvement of environmental efficiency, digital transformation, artificial intelligence, acceleration in autonomous and shared mobility, reduction in material consumption, and robotics can affect the baseline carbon footprint and mitigation potential of lifestyle change options will change. Hence it is difficult to predict how these changes will evolve by 2030.

This scenario assumes transformative changes in two parameters: renewable energy share and an improvement in environmental efficiency to achieve the 2030 mitigation target (2.5 t-CO_2e/capita/year) along with the proposed lifestyle change efforts (selected lifestyle change options with employed adoption rates). In this report, transformative systemic changes required to achieve the 2.5-t target are estimated as follows.

- A 3% annual improvement of environmental efficiency[4].
- The share of renewable energy (including hydro) is estimated at 53.4%, which is very high compared with both the existing national average of 16% and the anticipated renewable energy share of 22-24 % in 2030 in the current Basic Energy Plan.

With these assumptions, per capita lifestyle carbon footprint will be reduced from the current 7.0 t-CO_2e/year to 2.5 t-CO_2e/year (see Figure 5.1).

Figure 5.1 Changes in lifestyle carbon footprint with and without production side measures

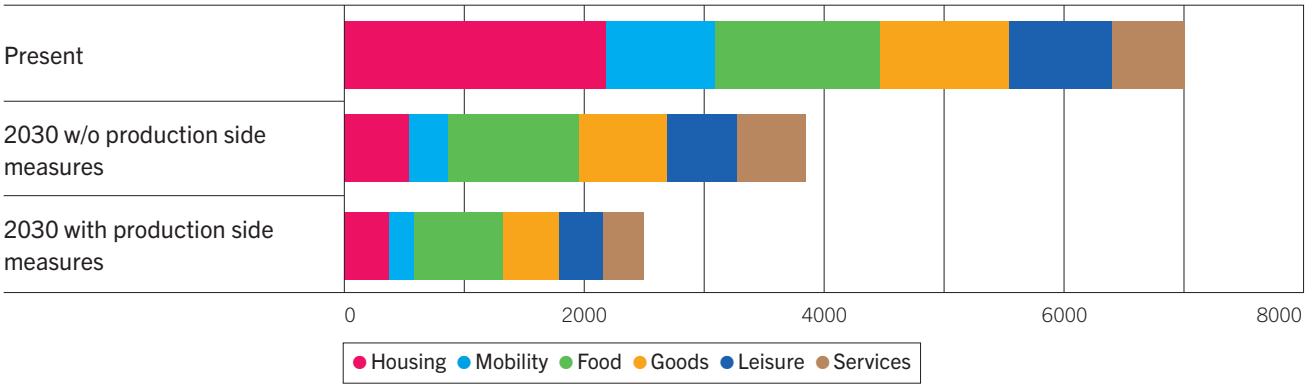
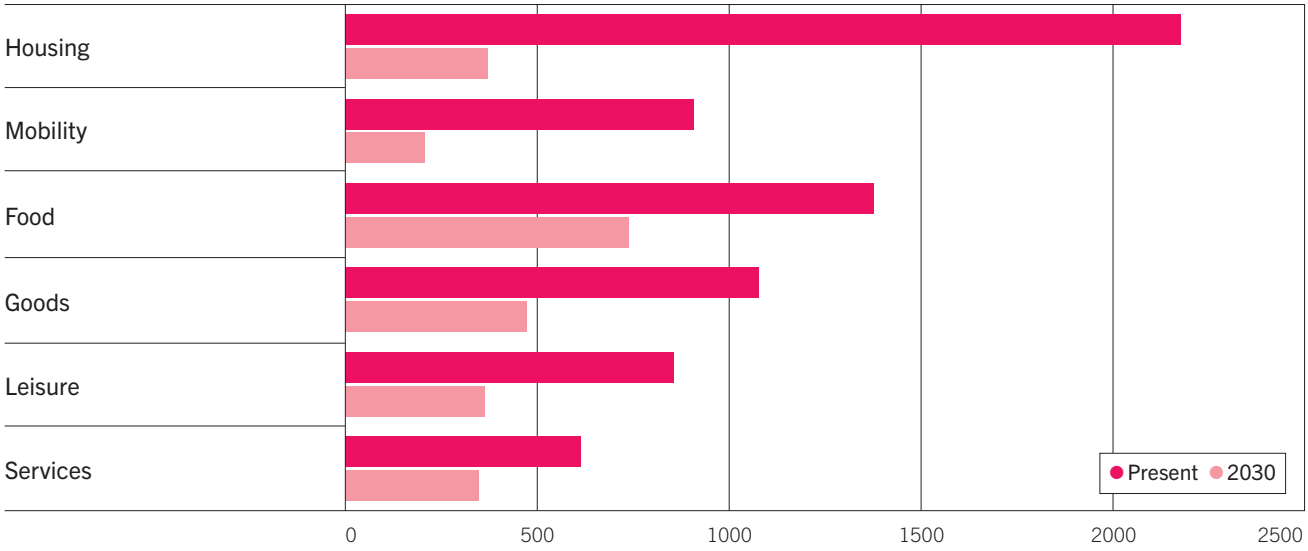


Figure 5.2 Changes in lifestyle carbon footprint



5.3 Co-benefits of 1.5°C Lifestyles

According to the authors and workshop participants, the proposed lifestyle change options not only reduce carbon footprint, but can also improve the lifestyle and livelihood of communities. These options must be contextualised in terms of an individual's value system. The lifestyle carbon footprint reduction options suggested in this scenario can have implications to enable the transformation of our social and economic systems to sustainable, resilient and inclusive ones, and may require changes in individual value systems such as a shift in priority from material abundance to satisfaction with sustainable way of living. The proposed lifestyle changes generate various co-benefits like a reduction in operation costs and consumption expenditure (e.g. less energy expenditure). There are also health benefits through options such as shifting from car to bicycle, or changing to a plant-based diet. Neighbourhood and community benefits may result from the adoption of active mobility that can lead to more appreciation and engagement with the local landscape because of reduced speed.

In housing, improved insulation of housing can reduce the health adversities related to extreme temperature. Improved energy efficiency can reduce energy bills. A shift from thermal electricity to renewable energy contributes to reducing fossil fuel imports and the financial savings will contribute to an improved fiscal balance.

In the food domain, many suggested lifestyle change options could enable consumption of a balanced and nutritious diet. Promotion of local vegetable consumption not only contributes to GHG emission reduction from the transportation process, but also strengthens the relationship between consumers and local farmers, which can make the city more attractive with better food security, revitalisation of local agriculture, and a more diverse and balanced land-use pattern.

For mobility, reduction in the use of private cars can mitigate traffic congestion and reduce on-source air pollution. Teleworking and shopping in bulk can further contribute to cleaner air and traffic-free streets. Shifting from conventional cars to electric vehicles (EV) and plug-in hybrid vehicles (PHV) will provide electricity storage capacity for the owners and will improve the resilience of communities in times of natural disasters.

In the consumer goods domain, more conscious purchasing behaviour may improve the prevalent business model of mass production and mass disposal of cheap products. Conscious purchase of quality products might extend their longevity, as well as reduce life cycle expenditure and embodied material consumption.

In the leisure domain, local and community-based activities can revitalise communities and neighbourhoods by attracting younger generations to live there.

4 In this scenario, environmental efficiency improvement is defined as reduction of carbon footprint intensity. 3% annual improvement results in 34% improvement by 2030, while IEA (2020) assumes 40% of energy efficiency improvement by 2030 in the sustainable development scenario.

6. RECOMMENDATIONS TO STAKEHOLDERS

- Individual lifestyle carbon footprint is an indicator of citizen's contribution to the GHG emissions resulting in climate change. However, reducing this footprint may require overcoming a systemic lock-in comprising of production and consumption, socio-economic, governance and techno-infrastructural trends. Transition towards sustainable lifestyles requires supporting measures by key stakeholders on both the consumption and production sides.

- Five categories of supporting measures are identified: social system transformation and transition, improvement of infrastructure and enabling environment, improvement in products and services, provision and dissemination of information and economic incentives.

- The workshop participants suggested two important supporting measures common to all lifestyle change options: 1) to disseminate the 1.5°C Lifestyles concept and lifestyle change options through education to all generations; and 2) to establish a participatory process to convey messages from citizens to the government.

- Governments should review existing regulations, start indicative planning and transition management to overcome lock-ins, and encourage a focus on sustainability for long-term changes such as teleworking.

- Governments should provide infrastructure for sustainable choice, and motivate citizens and business sectors to take action, as well as provide incentives for items such as electric vehicles and solar PV.

- The business sector should offer innovative products, services and related new business models, such as vegan diets, and plug-in hybrid vehicles (with renewable energy charging).

- Communities, workplaces and schools should carry out short-term, grassroots initiatives and dissemination actions, such as local recreational activities and local ecotourism.

6.1 Challenges or obstacles and potential supporting measures

People's lifestyles are not easy to change; some aspects are voluntary, while others are strongly influenced by the availability of and accessibility to products and services, as well as by the surrounding infrastructure and community conditions, resulting in a systemic lock-in.

To realise 1.5°C Lifestyles and scale up any changes at the societal level, obstacles as well as the enabling contexts should be identified through the participatory analysis, and expected supporting measures should be proposed to provide enabling contexts.

It was observed that with one exception, namely Plug-in Hybrid Vehicles with renewable energy electricity, all the other lifestyle options were experienced by at least one project participant. Nevertheless, there were many challenges to implement lifestyle carbon footprint reduction options. The main obstacles for participants to implement lifestyle change options can be summarised as follows:

1. Lack of infrastructure, products and services
2. Infrastructure, products and services exist but are not well known
3. High costs
4. Low accessibility
5. Conflicts with personal needs
6. Conflicts with other people's needs
7. Conflicts with societal norms

The participants in the household experiment identified supporting measures to overcome the obstacles. The proposed supporting measures can be categorised as: social system transformation and transition, improving the infrastructure and enabling environment, improving products and services, providing and disseminating information, and economic incentives. Table 6.1 shows supporting measures for the selected lifestyle change options, where supporting measures are particularly effective to facilitate or promote their adoption.

Table 6.1 Expected supportive measures or social changes

Lifestyle change option	Supporting measures				
	Social system transformation and transition	Improving infrastructure or implementation environment	Improving products and services	Providing and disseminating information	Economic incentives
Teleworking	• Adjust working rules • Awareness raising for managers and supervisors	• Provision of PC etc. • Better access system • Security measures	• Low price and high quality IT equipment, applications and service • Consultation service	Information provision on how to improve tele-working conditions	
• Living close to working place • Compact cities	• Urban planning • Land use planning	Correction of excessive concentration to mega cities			
Shifting car to bicycle	Proper enforcement of the road traffic law (with provision of adequate bike infrastructure)	• Bicycle parking, • Safe bicycle paths	Provision of low price electrically power assisted bike		
• Ride-sharing • Car-sharing	Deregulation of ride-off services for car sharing		Provision of matching applications		

Lifestyle change option	Supporting measures				
	Social system transformation and transition	Improving infrastructure or implementation environment	Improving products and services	Providing and disseminating information	Economic incentives
• Electric vehicles • Plug-in hybrid vehicles		• Increase share of renewable energy • Expand charging infrastructure	Improve cruising range	Provision of information on economic implications	Subsidy to reduce installation costs
• Hot water supply by heat pump • Solar PV • Solar water heaters	Review of regulation for installation in housing complexes		• Rental and leasing services • Development of products that can meet landscape regulations and installation location restrictions	Provision of information on economic implications	Subsidy to reduce installation costs
• Life Cycle Carbon Minus House • Zero Energy House • Nearly ZEH	Regulation for installation in housing complexes		Development of low-cost, high-performance products	Provision of information on economic implications	Subsidy to reduce installation costs
• Vegan • Vegetarian • Shift from traditional meat to alternative meat			• Development of low-cost, high-performance products • Development of attractive recipes	• Events and workshops for information dissemination • Provision of nutritious information to address health concerns	
• Eating seasonal vegetables • Eating local vegetables	Utilisation of abandoned farmland	Improvement of distribution of local vegetables	• Improvement of varieties suitable for open-air cultivation • Development of attractive recipes	• Promotion of exchange between producers and consumers • Promotion of food education	
Longer use and recycling of products (clothes, bags and jewellery, electrical equipment etc.)	• Standard setting for long life high performance products • Deregulation for organising free market at public space		• Provision of long life high performance products with reasonable price • Provision of matching applications	Information for recycling and repair service	

Lifestyle change option	Supporting measures				
	Social system transformation and transition	Improving infrastructure or implementation environment	Improving products and services	Providing and disseminating information	Economic incentives
Sharing of books and magazines, use of ebooks and libraries		Provision of library	• Provision of ebook readers at a reasonable price • Provision of user friendly searching applications		
• Local recreational activities • Local ecotourism	Coordination with landscape development and nature conservation	Development of camping and lodging facilities		Dissemination of information on activities and tours	Subsidy to local farmers

In addition, two important supporting measures common to all lifestyle change options were suggested by workshop participants: one is to disseminate the 1.5°C Lifestyles concept and lifestyle change options through education to all generations, and the other is to establish participatory process to deliver messages from citizens to the government.

6.2 Roles of stakeholders to enable lifestyle changes

This sub-section provides policy recommendations to co-create 1.5°C Lifestyles through stakeholder collaboration, and hopes that such recommendations will lead to the formation of new values and social norms. Table 6.2 summarise enabling contexts to implement and facilitate lifestyle change options for key stakeholders.

Table 6.2 Policy recommendations for key stakeholders

Obstacles	Enabling Contexts	Recommendations to Stakeholders		
		National and Local Governments	Business	Citizens and Civil Society Organisations
Infrastructure, Service or Goods do not exist (e.g. Rental Zero-Energy Houses)	Infrastructure, Service or Goods are provided	• Reviewing regulations • Infrastructure development • Investment promotion • Public procurement	• Provision of goods and service • Joint-development of goods and services with governments and citizens • Services improvement	
Infrastructure, Service or Goods exist but are not well known (e.g. 100% Renewable Energy Contract)	Information on infrastructure, services or goods are provided	• User-friendly information provision • Labelling • Media campaign	• Provision of user-friendly information • Consulting services (e.g. houses, transportation) • Provision of searching service, mobile apps, etc. • Events	Joint-event with local governments or business

Obstacles	Enabling Contexts	Recommendations to Stakeholders		
		National and Local Governments	Business	Citizens and Civil Society Organisations
Infrastructure, Service or Goods exist but are too expensive (e.g. Zero Energy Houses)	Infrastructure, Service or Goods become more affordable	• Tax reform • Subsidy • Price regulation	Provision of more affordable goods and services	
Infrastructure, Service or Goods exist but are too difficult to find and access (e.g. Vegan Foods, Car sharing)	Infrastructure, Service or Goods become more easily accessed found and obtained	Support citizens and business to create more accessible goods or services	Provision of searching service, mobile apps, etc.	• Mapping of goods and services in cooperation with local business, co-ops, etc. • Identifying locally available goods and services
Taking the option might cause conflict with other daily needs (e.g. Commuting to workplace by Bus)I)	Options where different needs are met together available	Support citizens and business to create and share options	• Services improvement • Joint-development of goods and services with governments and citizens	• Group buying • Joint-development of goods and services with governments and business (e.g. Living lab) • Sharing citizens' wisdom
Taking the option might cause conflict with others' needs (e.g. Online home visits do not make grandparents happy e.g. Vegetarian foods are good for parents but questionable for children)	Options where needs of different people are met together are available	Support citizens and business to create and share options	• Services improvement • Joint-development of goods and services with governments and citizens	• Joint-development of goods and services with governments and business (e.g. Living lab) • Sharing citizen's wisdom
Taking the option does not go along with the informal rules or norms of the community or workplaces (e.g. Adjust clothes e.g. Unable to install rooftop PV on historical areas)	Informal rules and norms are revisited and modified for encouraging low-carbon actions	• Support community actions • Encourage business to change office rules • Initiate public-citizen collaboration	• Services improvement • Joint-development of goods and services with governments and citizens • Joint-event with citizens groups and communities	• Local events and workshops • Revision of rules in cooperation with governments and business

7. CONCLUSIONS

Key findings of this scenario indicate that after the adoption of identified low-carbon lifestyle options, the average carbon footprint of Kyoto's citizens can be reduced from 7t-CO_2e/capita/year to 3.8 t-CO_2e/year in 2030 (-45%), assuming no changes in renewable energy share and no environmental efficiency improvement. There are existing initiatives in Kyoto and Japan to increase renewable energy share, to improve environmental efficiency, and to promote the digital transformation, artificial intelligence, autonomous and shared mobility, reduction in material consumption, all of which are expected to contribute to reducing the carbon footprint and narrowing the gap to be filled by households to achieve the 1.5°C Lifestyles target of 2.5 t-CO_2e/capita/year by 2030. If, for example, the share of renewable energy increases to 53% and environmental efficiency shows an annual improvement of 3%, our proposed lifestyle changes can meet 1.5°C Lifestyles of 2.5t-CO_2e/capita/year target by 2030 (-64%).

In conclusion, this scenario envisions Kyoto in 2030 with the implementation of 1.5°C Lifestyles, where households will adopt various lifestyle change options through collaborative efforts by all key stakeholders, such as national and local governments, the business sector and local communities. A wide range of stakeholders must share the responsibilities and expected roles in achieving a net zero carbon society whilst also having good quality of life.

This scenario provides a roadmap for the co-creation of a desired decarbonised and sustainable future by diverse stakeholders. In this context, the importance of households becomes clearer: not only do they implement lifestyle change options but they can also send a message to governments and businesses calling on them to provide supporting measures that in turn provide the enabling conditions for stakeholders to take action. This will open the window for discussions on the co-creation of 1.5°C Lifestyles beyond the boundaries of government, business and citizens. Consumer practices, markets, services, technology and social rules need to be interdependent, and must co-evolve. Consumer behaviour change requires three aligned factors: motivation and intention, ability, and opportunity. If consumers are to overcome obstacles and smoothly transition to 1.5°C Lifestyles, then stakeholders must collaborate. Key stakeholders (national and local governments, producers and businesses, citizens and Civil Society Organisations) need to play their part and work together on co-creation. In particular, governments should review existing regulations, start indicative planning and transition management to overcome lock-ins, and stimulate a sustainability focus for long-term change. Governments must also provide infrastructure for sustainable choice, and motivate citizens and business sectors to take action, as well as provide feedback. The business sector should offer innovative products and services, and come up with related new business models. Citizens should exercise sustainable choice, and work with governments and businesses to develop goods and services (e.g. Living Lab). Communities, workplaces and schools can carry out short-term, grass-root initiatives and dissemination actions.

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