# Application of AIM models for Local LCS scenarios in Japan

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- Two Tools for Local LCS
- 3 Env. Goals & Budget Constraints
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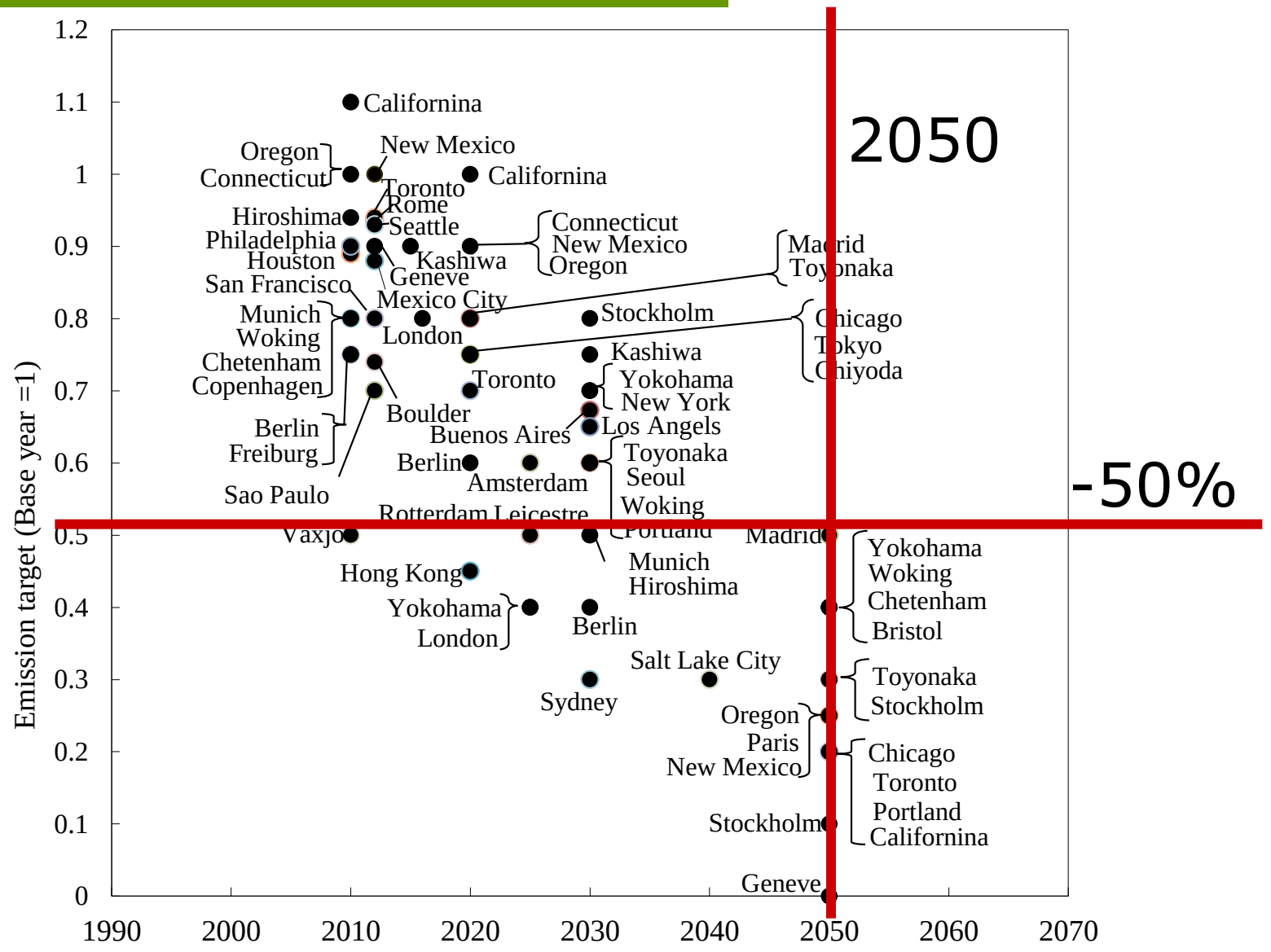
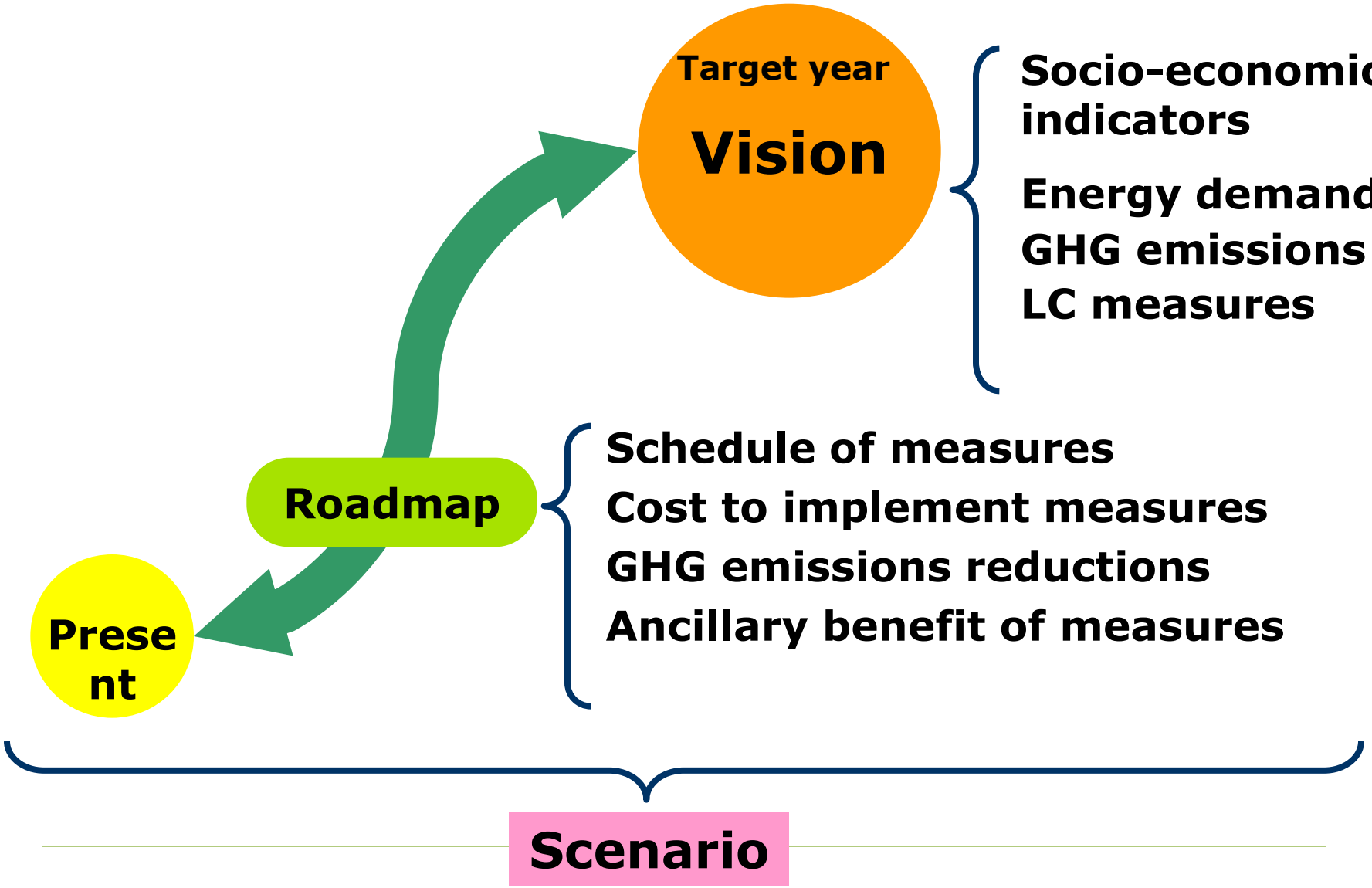
# Emission targets of cities



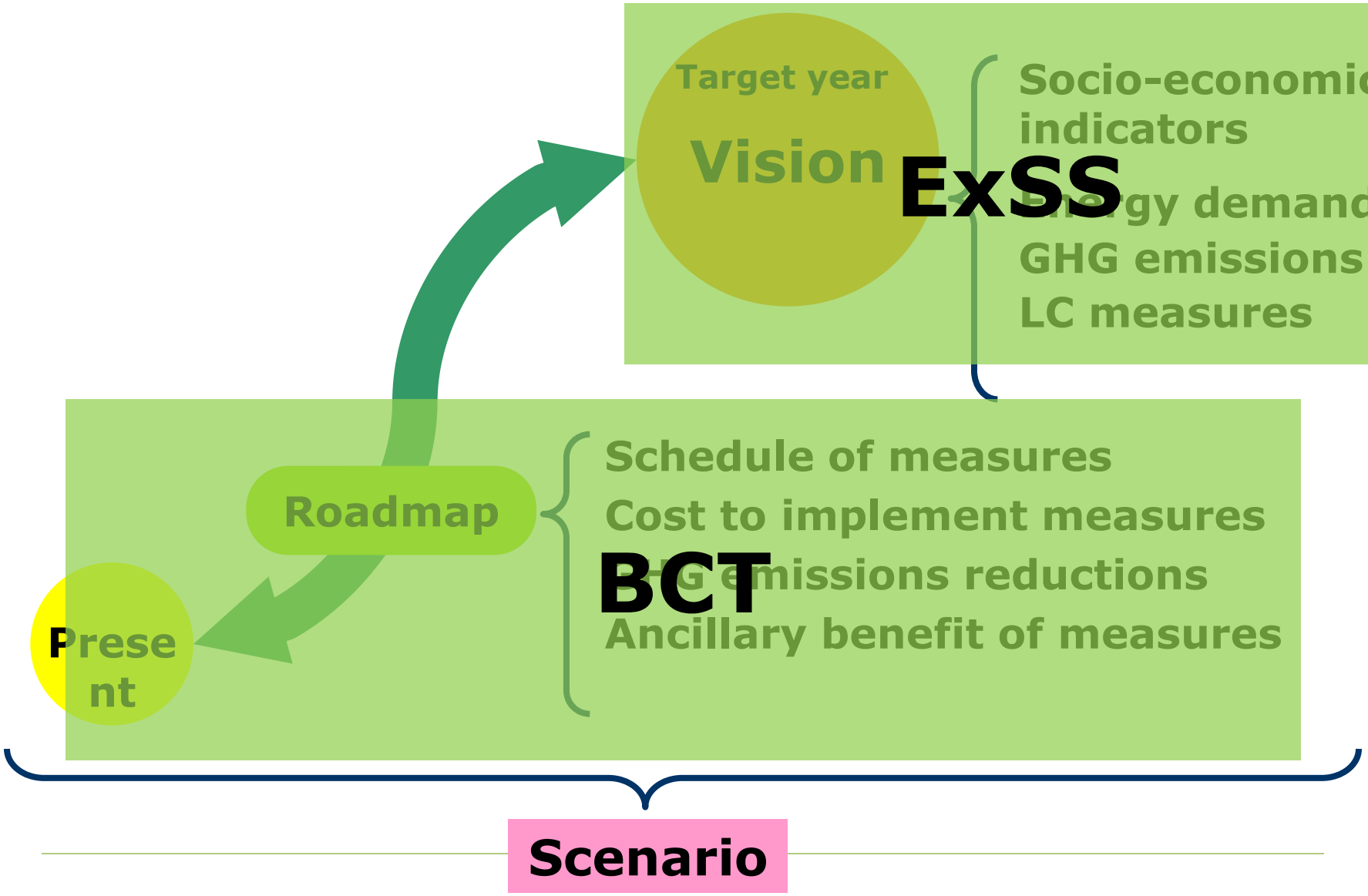
# Tools for Local LCS

- Extended Snapshot Tool (ExSS)
- Backcasting Tool (BCT)

# Backcasting Approach

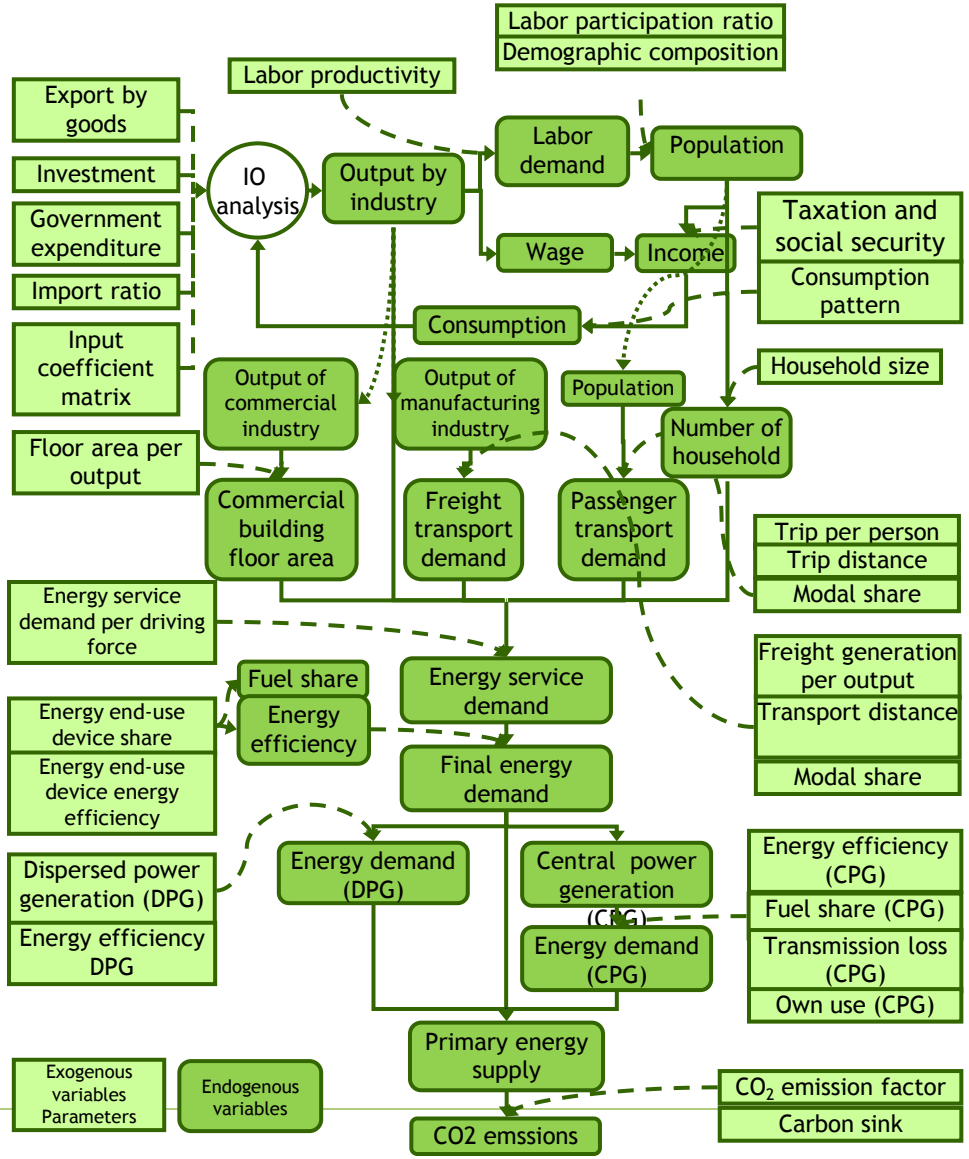


# Backcasting Approach



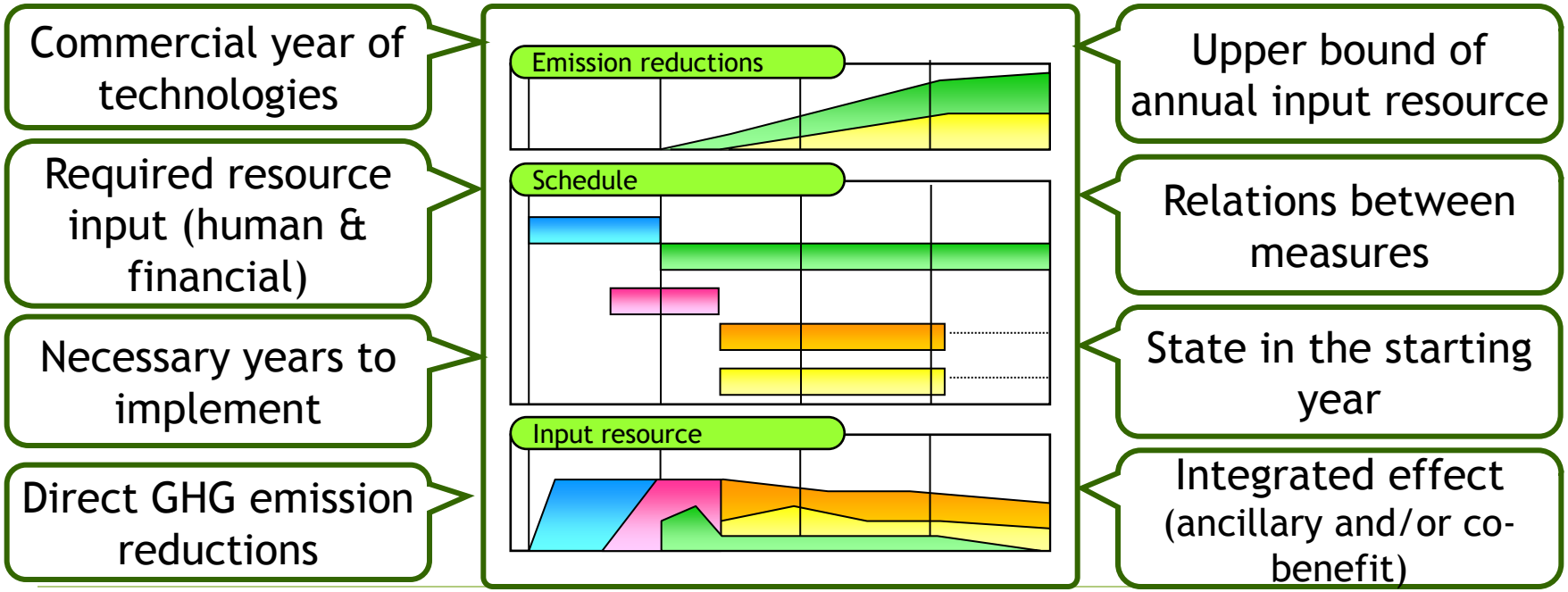
# Extended Snapshot Tool (ExSS)

- A static model
- 6000 endogenous variables
- Formulated by GAMS
- Input and Output are MS Excel spread sheets.

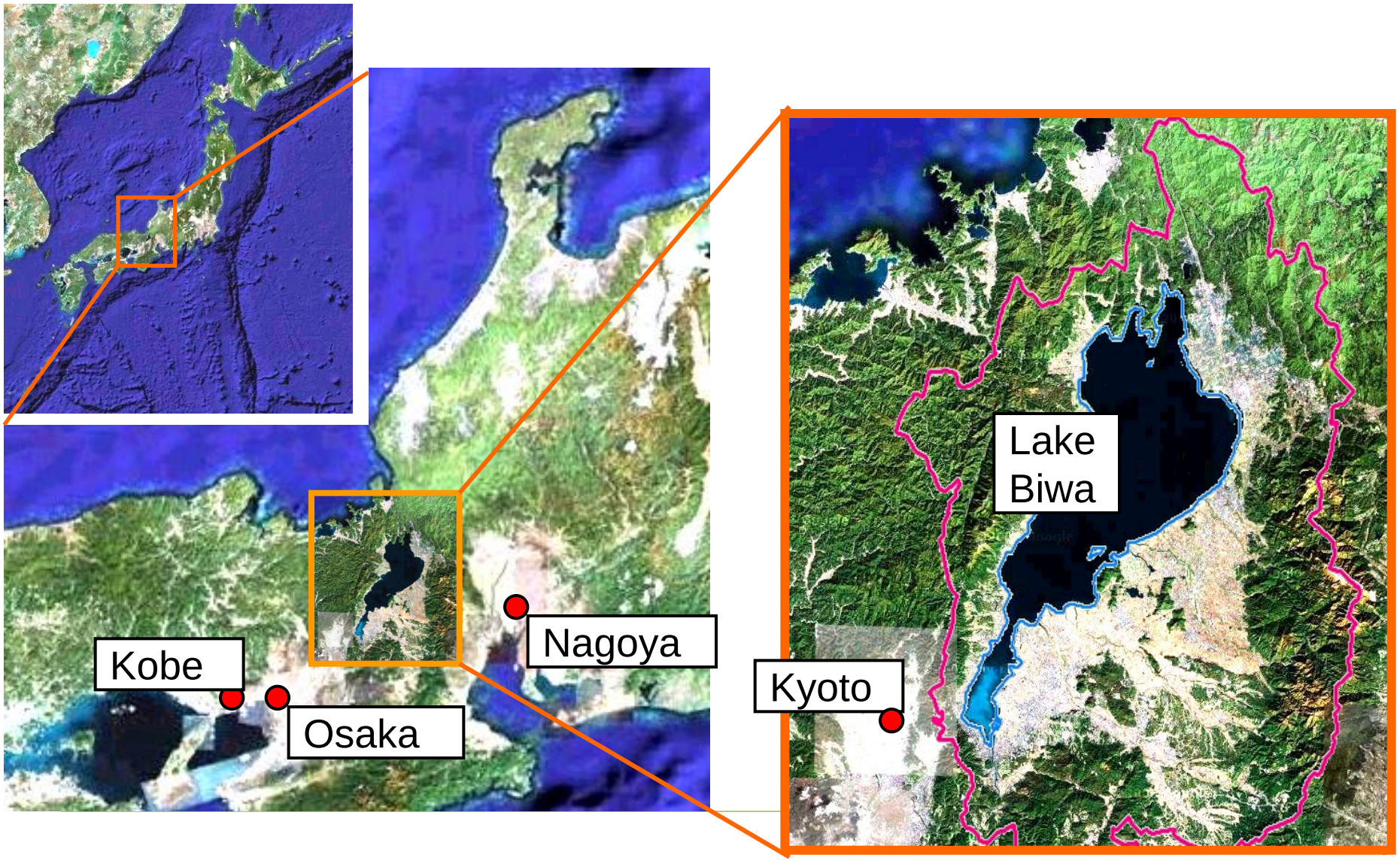


# Backcasting Tool (BCT)

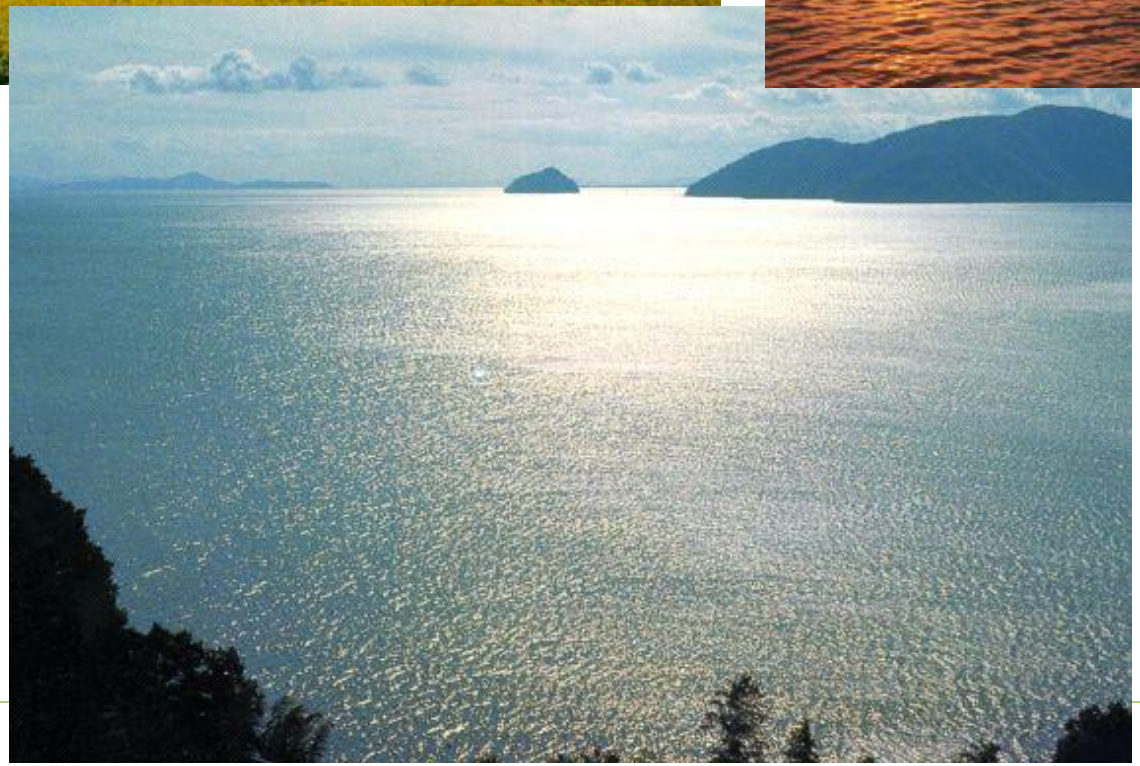
- BCT estimates,
  - Schedule of measures to achieve LCS
  - Emission reduction pass
  - Annual input resource



# Shiga prefecture



# Lake Biwa & Surrounding Mt.



# Shiga Prefecture in 2000

- Population : 1.39 million
- Gross Regional Product:
  - 5935 bill.YEN ( 60bill.$)
  - 4.25 mill.YEN/capita (43000$/capita)
- $CO_2$ emissions:
  - 12.5Mt-$CO_2$
  - 9.0t-$CO_2$/capita

# Three Environmental Goals

## Climate change mitigation

GHG emissions :

-50% (related to 1990)

## Revival of Lake Biwa environment

Nutrient load inflow :

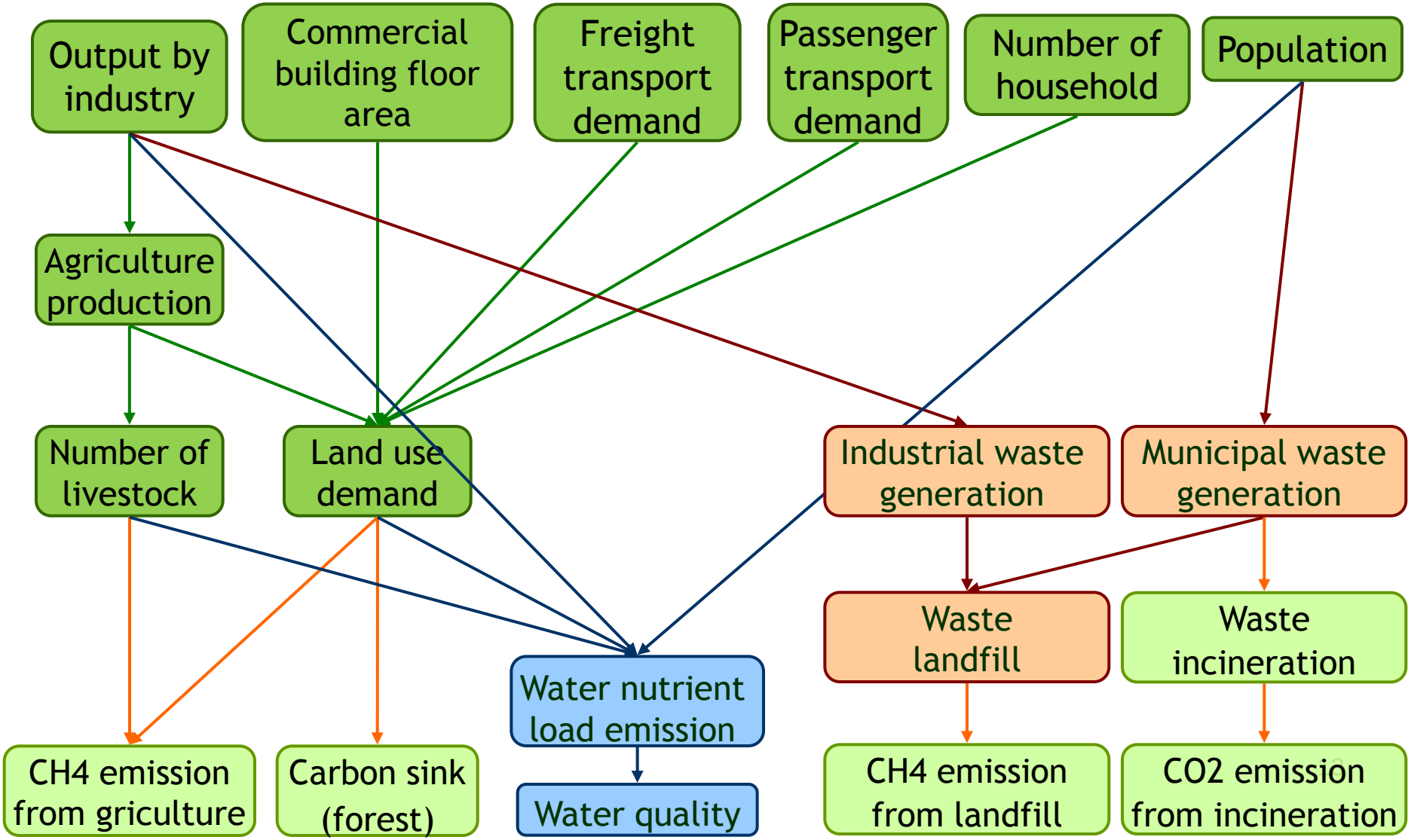
-50%

## Recycling system

Landfill waste:

-75%

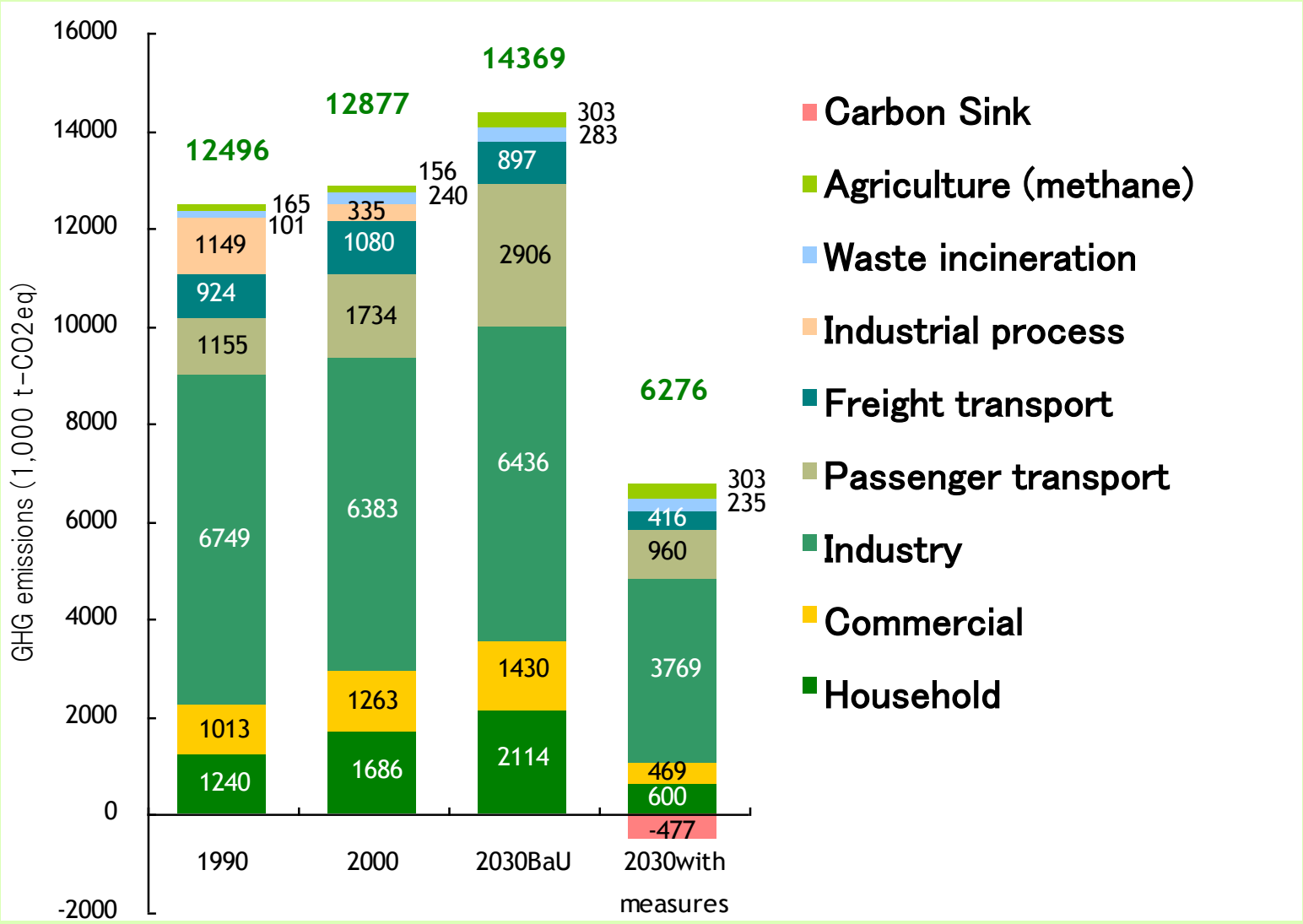
# Extension of ExSS



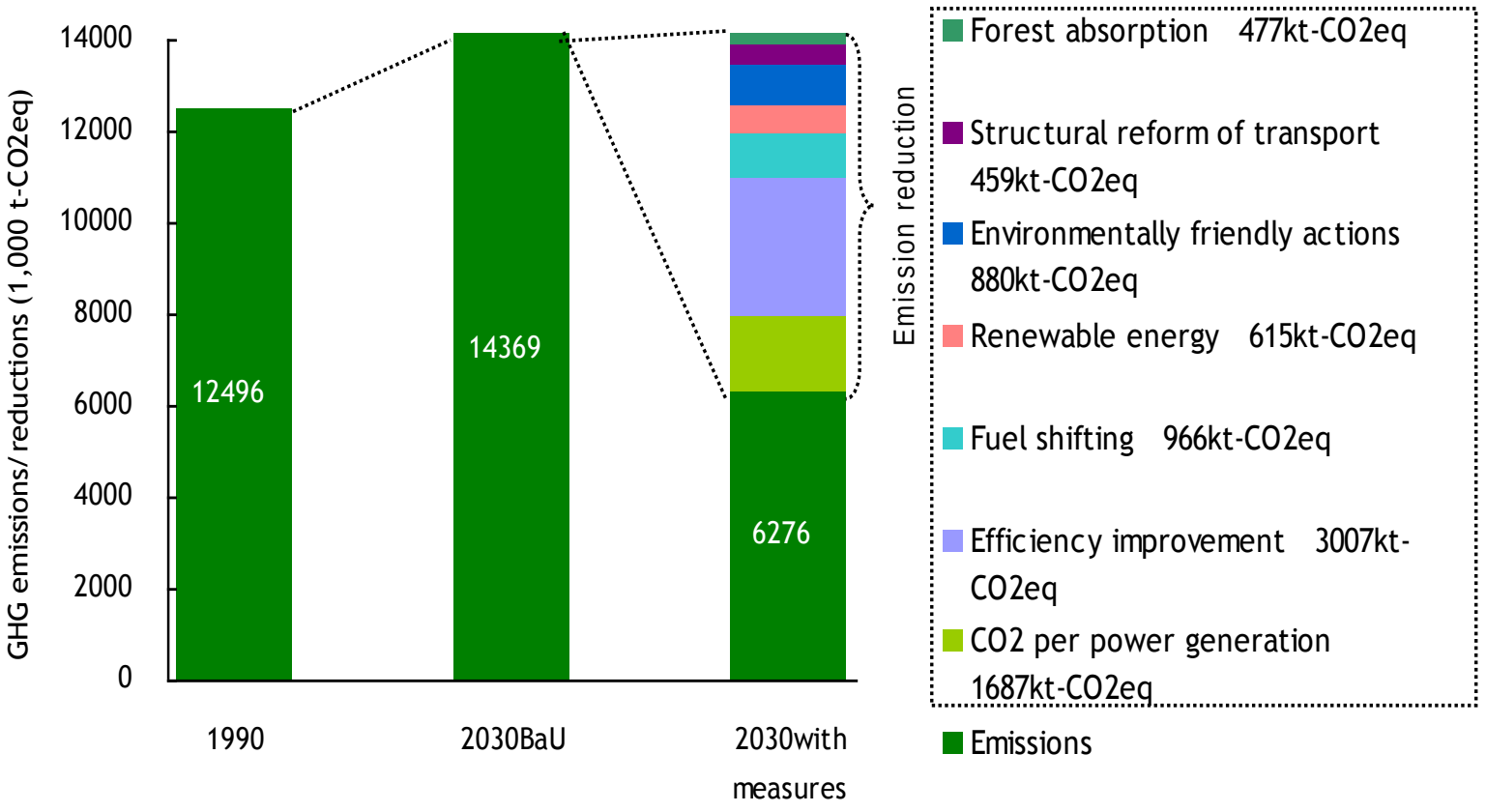
# Socio-Economic Scenario

| | 2005 | 2030 BaU | 2030BaU/ 2005 |
|---|---|---|---|
| Population ($10^3$) | 1397 | 1381 | 0.99 |
| No. of households ($10^3$) | 439 | 521 | 1.19 |
| GDP (bill yen) | 5935 | 7677 | 1.29 |
| GDP per capita (mill yen/capita) | 4.25 | 5.56 | 1.31 |
| Gross output (trill. yen) | 12 | 13 | 1.16 |
| Primary industry | 95 | 564 | 5.91 |
| Secondary industry | 7220 | 6470 | 0.90 |
| Tertiary industry | 4269 | 6401 | 1.50 |
| Commercial floor area (mill.$m^2$) | 20 | 23 | 1.13 |
| Passenger transport (mill p-km) | 10670 | 16367 | 1.53 |
| Freight transport (mill t-km) | 3937 | 3397 | 0.86 |

# GHG Emissions in 2030



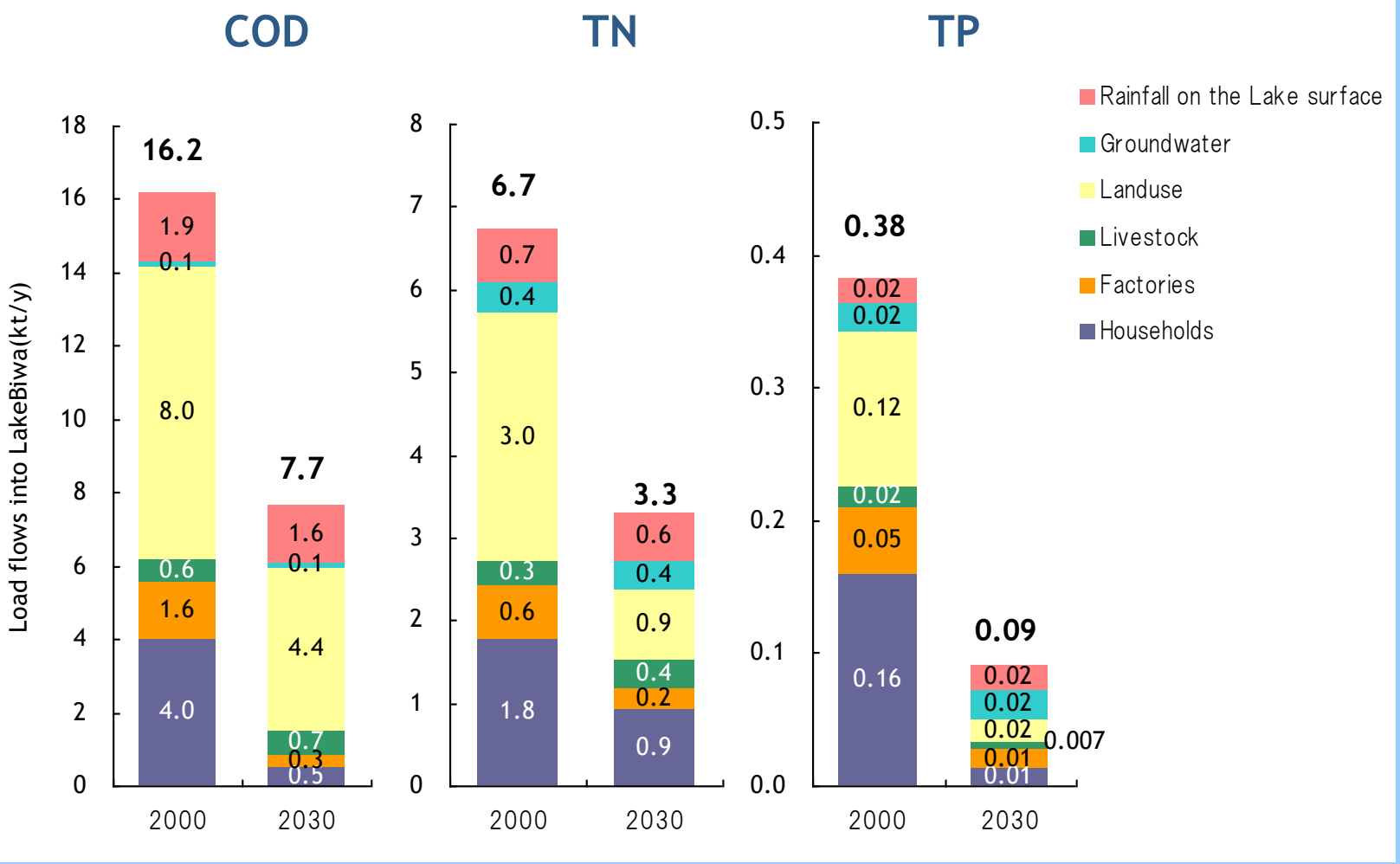
# Emission reduction by measures



# 70+ direct options in 2030

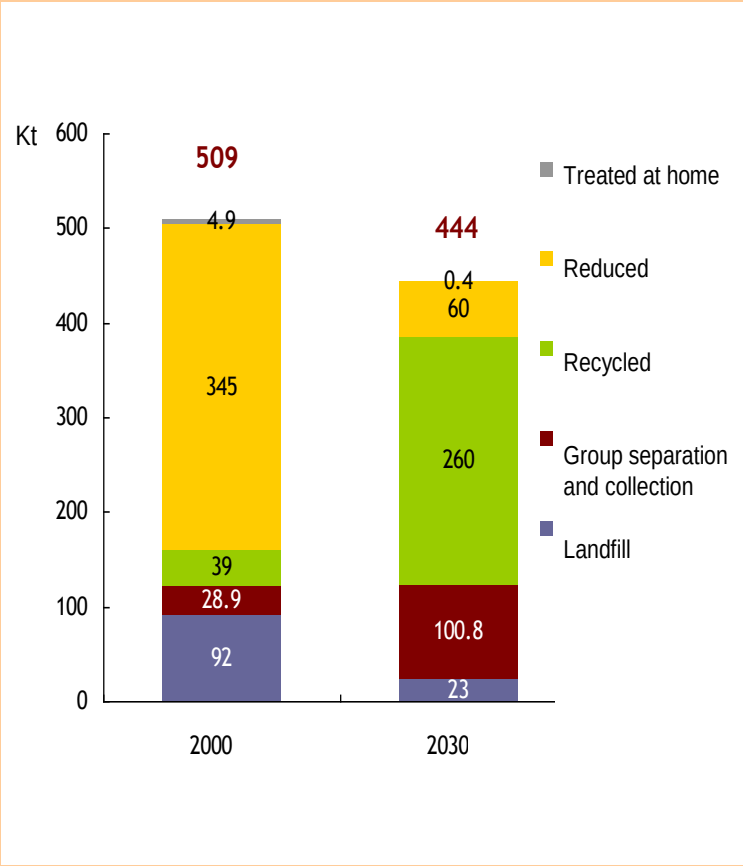
| Sector | Measure | Status to be achieved by 2030 | What should be done now to achieve the status | Reduction |
|---|---|---|---|---|
| Household | Energy efficiency of equipment | Improvement of efficiency by 30% in total | Improvement rate of approximately 0.8% per annum; Selection of more energy efficient products at the time of replacement | 551 |
| | HEMS | Penetration at 90% of houses | Start of penetration | 60 |
| | Heat insulation level in houses | Achievement of the next-generation heat insulation level in 90% of houses | Selection of high heat insulation level at the time of newly building, remodeling, and changing houses | 55 |
| | Biomass heating | Penetration at 10% of households | Selection of biomass at the time of replacement of heating appliance | 39 |
| | Passive solar heating | Penetration at 10% of households | Installation at the time of newly building and remodeling houses | 39 |
| | Energy saving actions | Penetration at almost all households | Start of penetration, and education | 156 |
| | Photovoltaic power | Penetration at 20% of households | Continuous expansion | 54 |
| | Solar water heater | Penetration at 20% of households | Continuous expansion | 99 |
| | Other | | | 89 |
| | Total in households | | | 1144 |
| Business | Energy efficiency of equipment | Improvement of efficiency by 36% in total | Improvement rate of 1% per annum; Promotion of investment in energy saving | 443 |
| | BEMS (business energy management system) | Introduction to 90% of buildings | | 47 |
| | Heat insulation level in business buildings | 90% of energy saving buildings in all buildings | Selection of high heat insulation level at the time of new construction | 31 |
| | Biomass heating | Penetration rate of 10% | Start of penetration | 19 |
| | Energy saving actions | Penetration at almost all business establishments | Start of penetration, and education | 43 |
| | Photovoltaic power | Installation at 15% of buildings | Expanded penetration | 12 |
| | Other | | | 79 |
| | Total in businesses | | | 674 |
| Industry | Energy efficiency of equipment | Improvement of efficiency by 28% in total | Selection of more energy efficient products at the time of renewal of facilities | 846 |
| | Fuel shift | | Selection of less carbon intensive fuel at the time of renewal of facilities | 883 |
| | Natural gas | 2000 8.6%→25.9% | | |
| | Oil | 2000 55.5%→39.4% | | |
| | Coal | 2000 4.9%→0.9% | | |
| | Electric Power | 2000 30.9%→33.7% | | |
| | Total in industry | | | 1729 |
| Passenger | Compact city | Reduction of average distance of intra-city travel by 25% | Prevention of extension of urban area, and vitalization of urban centers | 215 |
| | Improvement of fuel efficiency of automobiles | Improvement of average fuel efficiency of passenger cars by 60% (penetration of hybrid cars at 90%) | Selection of cars with high fuel efficiency at the time of the purchase of a new car | 788 |
| | Public transport, bicycles, and walking | Share of railway:36% (31% in 2000) Shares of bicycles and walking: 16% in total | Development of public transport (improvement of convenience) Development of sidewalks, bicycle roads, signals, etc. | 633<br>633 |
| | Biomass fuel | Penetration rate of 10% | Start of introduction in some parts | 193 |
| | Others | | | 36 |
| | Total in passenger transport | | | 1865 |
| Freight | Enhancement of logistics efficiency | Reduction of transport per production by 30% | Development of distribution centers, etc. | 51 |
| | Modal shift | Substitution of railway transport for freight for 50% of road transport to distant prefectures | Development of railway for freight transport | 194 |
| | | Substitution of lake transport for 10% of the transport within the prefecture | Planning and development of the idea | |
| | Biomass fuel | Penetration rate of 10% | Start of introduction | 75 |
| | Others | | | 150 |
| | Total in freight | | | 470 |
| Others | Reduction of CO2 emissions per power generation | | | 1687 |
| | Forest development | Management of all artificial forests in Shiga Prefecture | Establishment and execution of the maintenance plan; and financing for the maintenance of forests | 477 |
| | Recycling of waste | Improvement of the recycling rate of plastic by 36% | Promotion of separated collection and reuse | 48 |
| Total | | | | 8094 |
| | | | | kt-$CO_2$eq |

# Water Nutrient Load

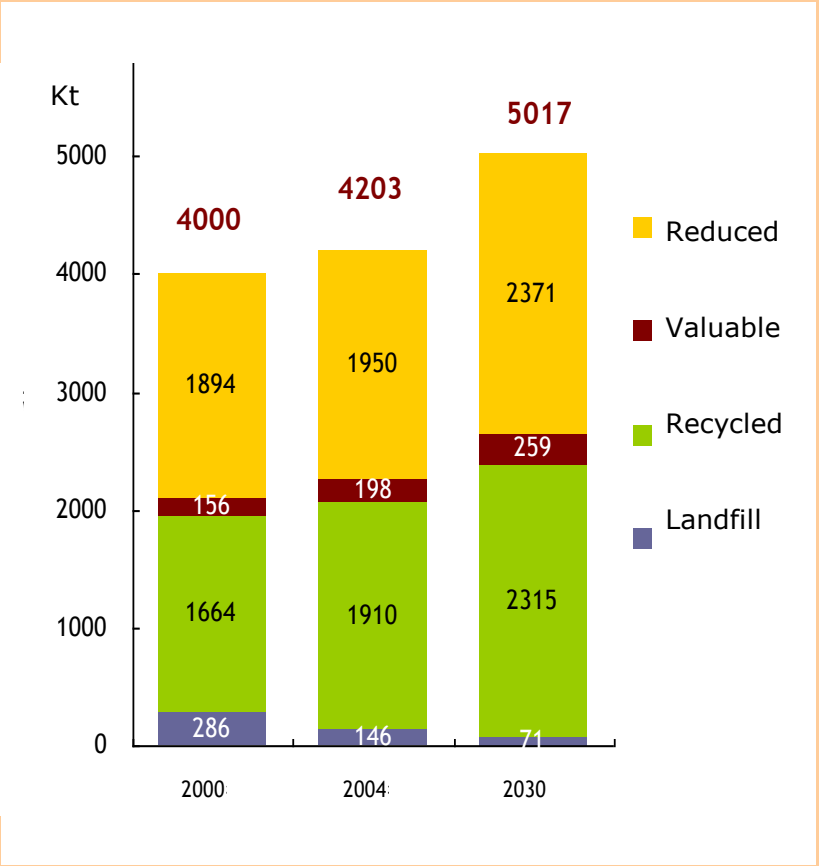


# Waste Landfill

## Generation and landfill of municipal waste




## Generation and landfill of industrial waste



# LCS Roadmap using BCM

1. Find barriers and indirect options
2. Develop Option Trees
3. Input parameters
   - Cost
   - Budget constraint
   - Relation between options
4. Run BCM

# The Option Trees

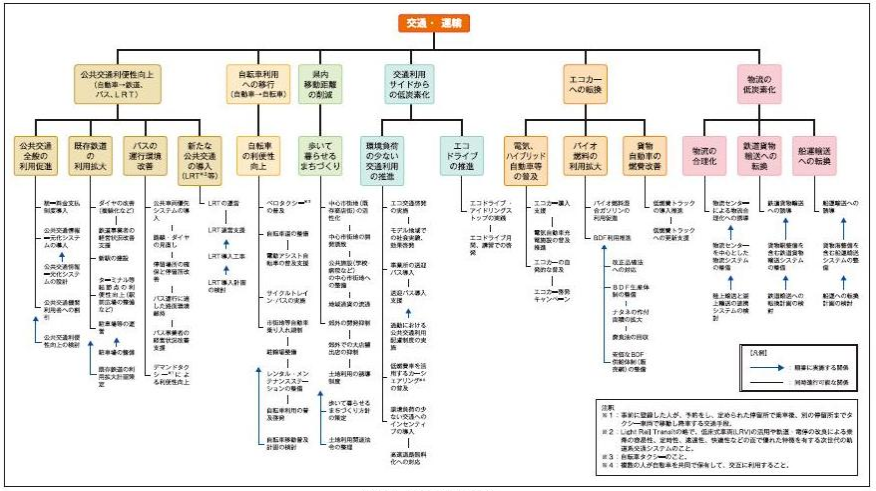



図 3-2-1．体系図 （交通・運輸）

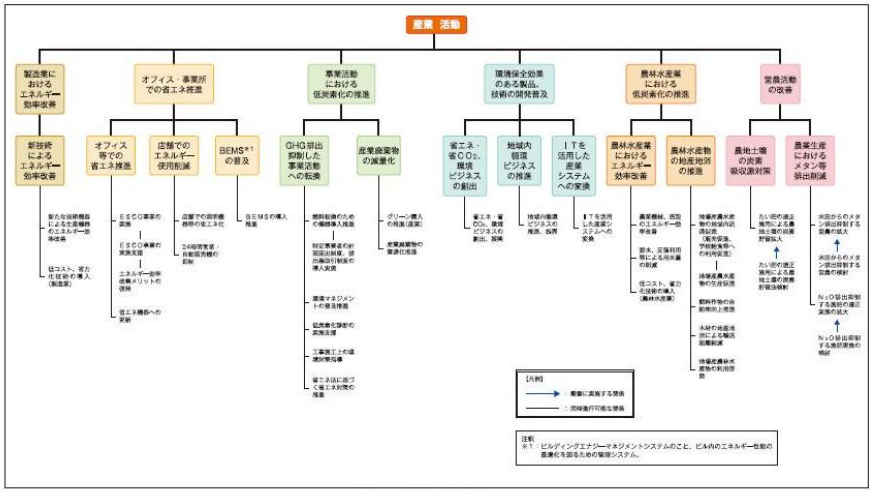



図 3-4-1．体系図 （産業活動）

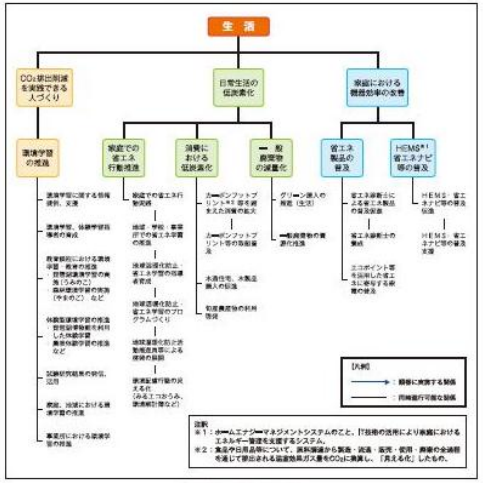



図 3-1-1．体系図（生活）

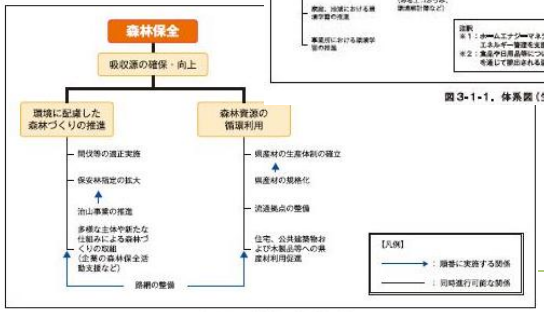



図 3-6-1．体系図（森林保全）

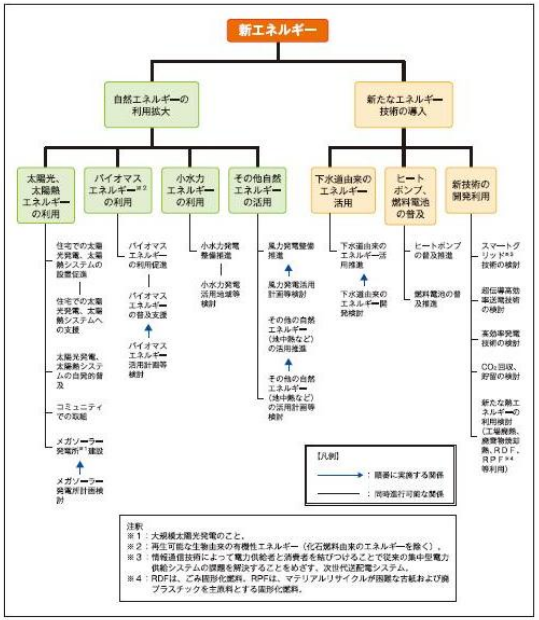



図 3-5-1．体系図（新エネルギー）

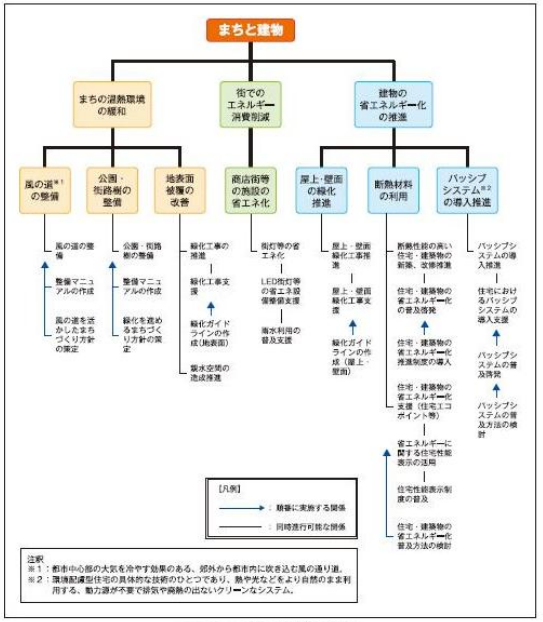



図 3-3-1．体系図（まちと建物）

# The Option Trees

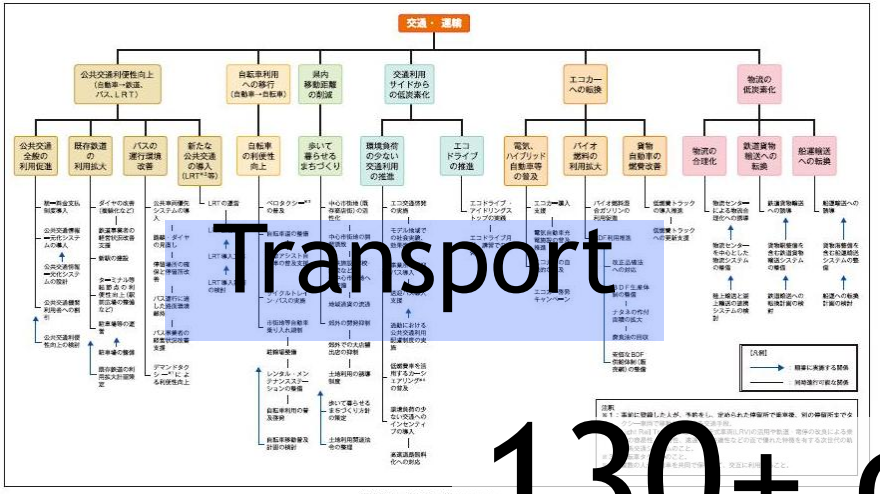



図 3-2-1．体系図（交通・運輸）

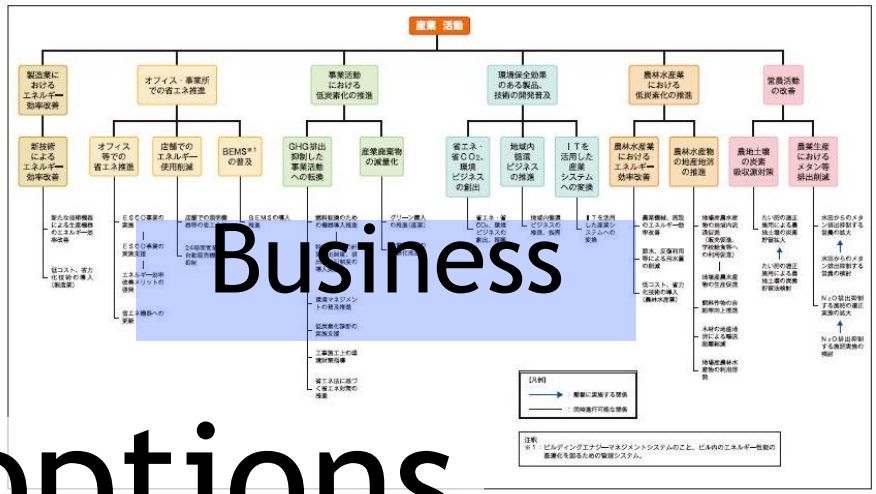
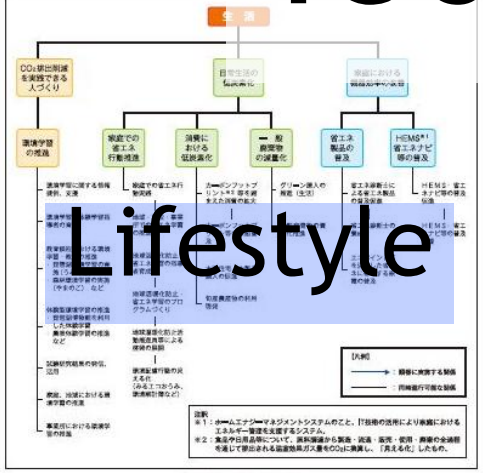



図 3-4-1．体系図（産業活動）

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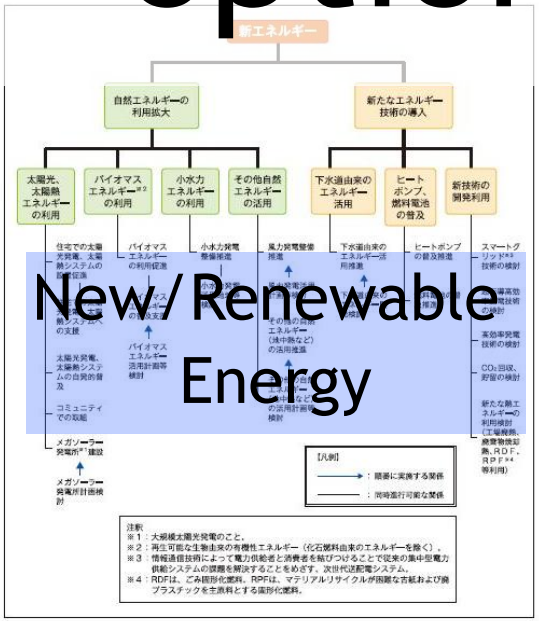



図 3-5-1．体系図（新エネルギー）

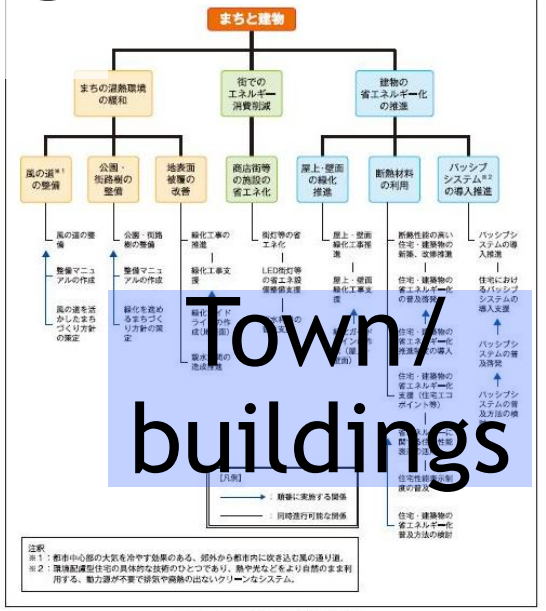



図 3-3-1．体系図（まちと建物）


図 3-6-1．体系図（森林保全）

Transport

Business

130+ options

Lifestyle

New/Renewable Energy

Town / buildings

Forest conservation

# Constraints

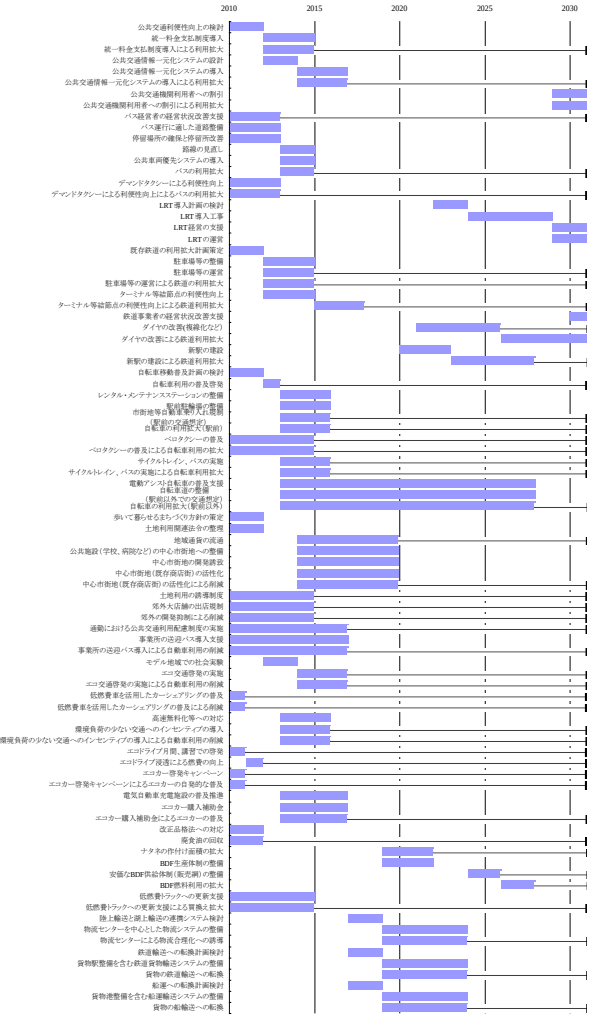
- Upper bound of gov. expenditure
  - 15bill.YEN (2010-2012)
  - 65bill.YEN (2013-2030)

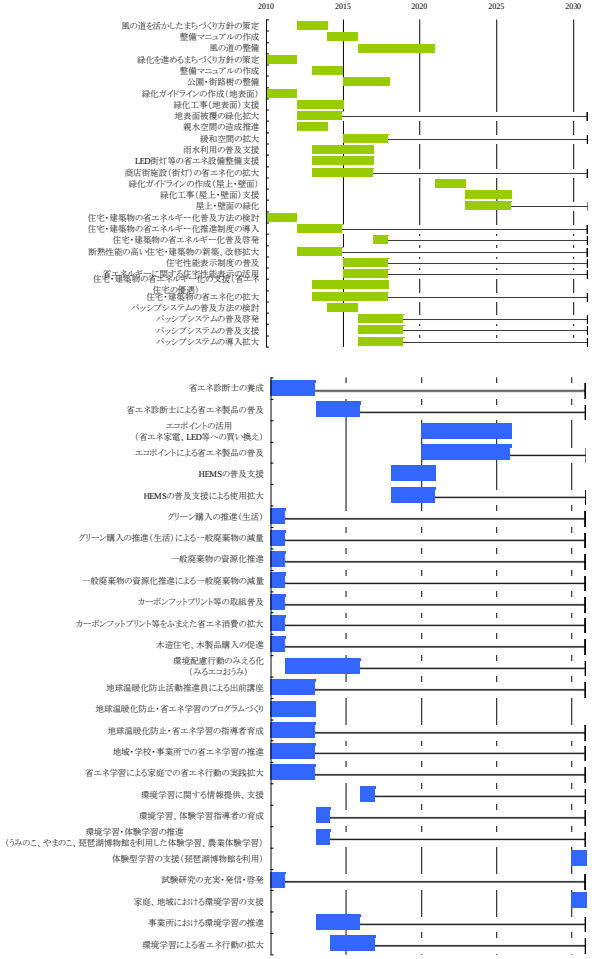
  cf. Shiga Pref's budget: 500bill.YEN (FY2010)

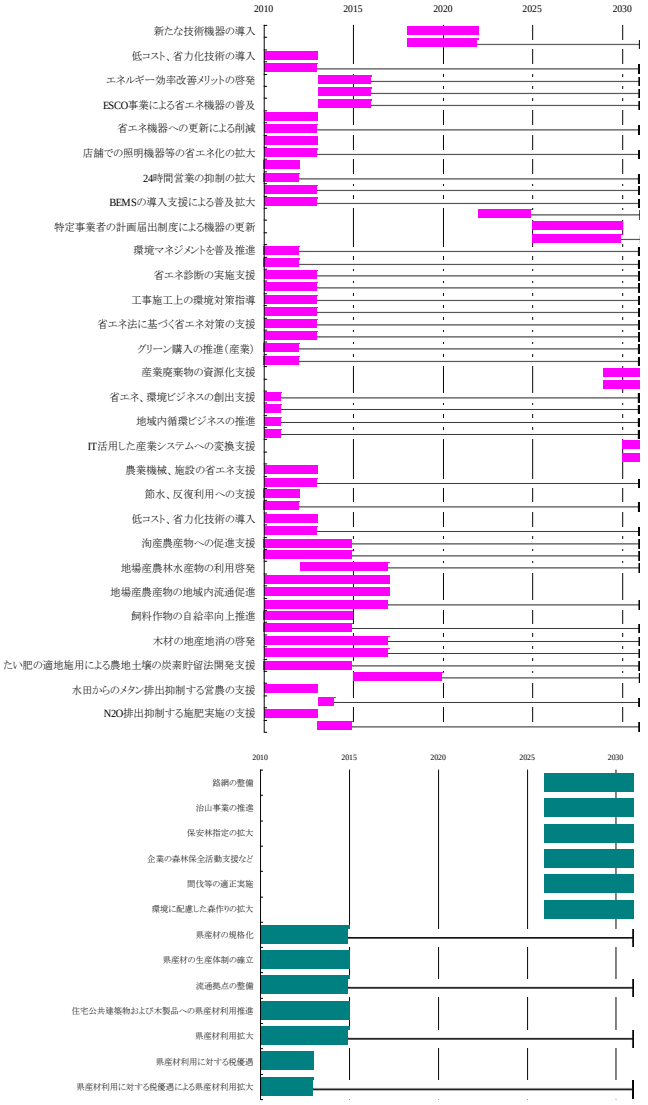
- No limit in private expenditure

- Gov. expenditure includes;
  - Subsidy
  - Infrastructure construction
  - Installation of energy-efficient equipments in government facilities

# Results: Implementation pass

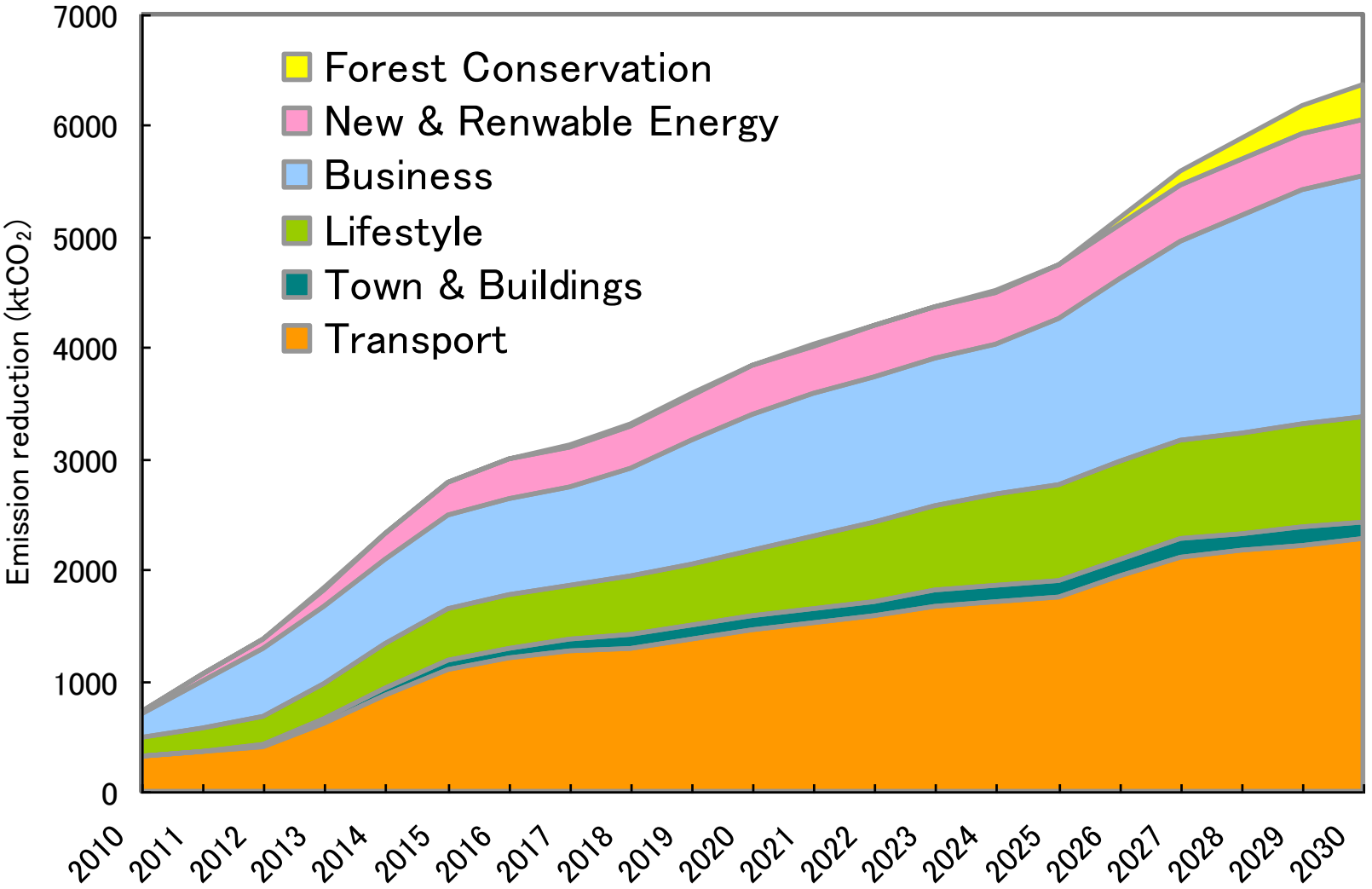


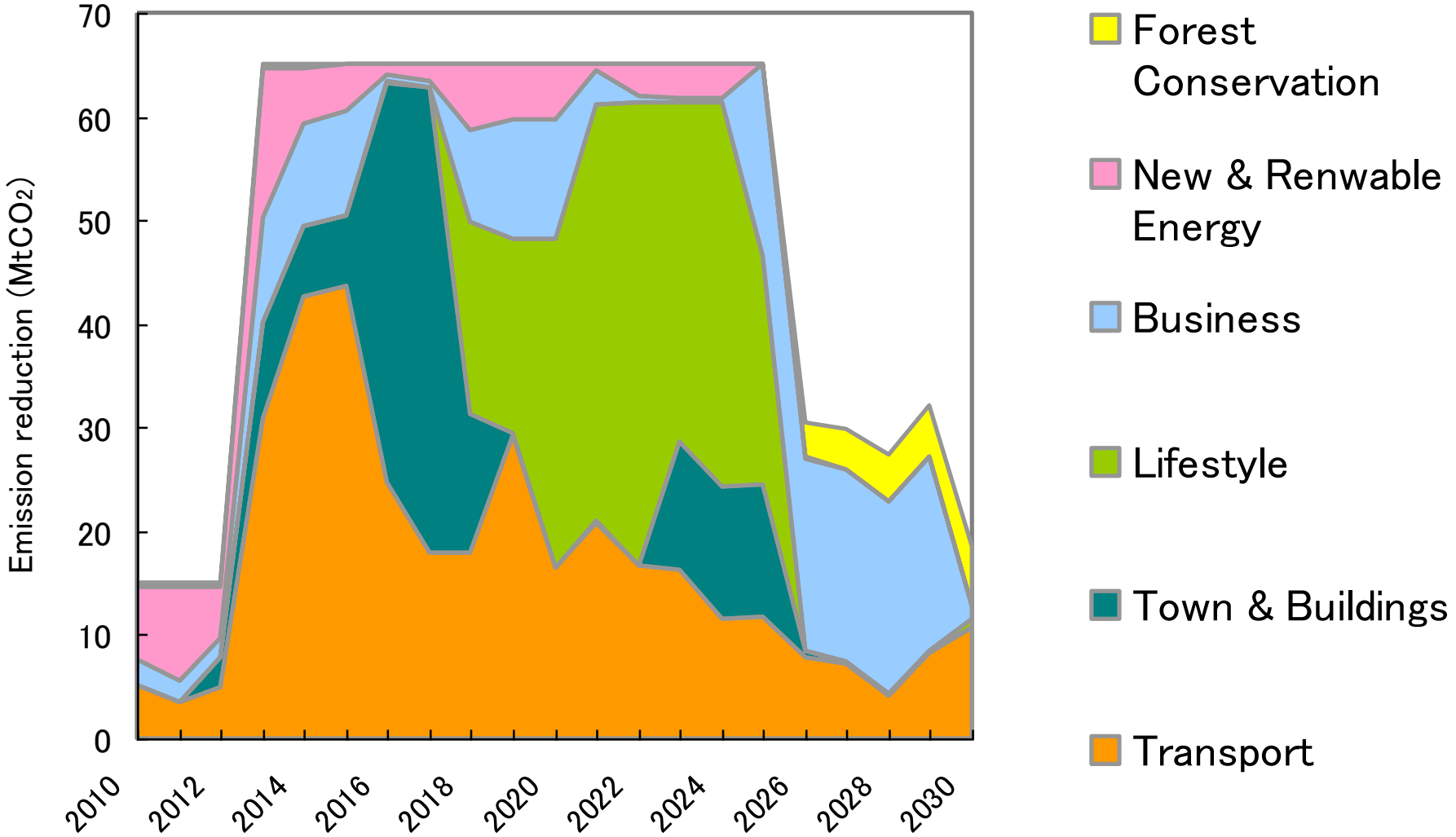



# Emission reduction pass

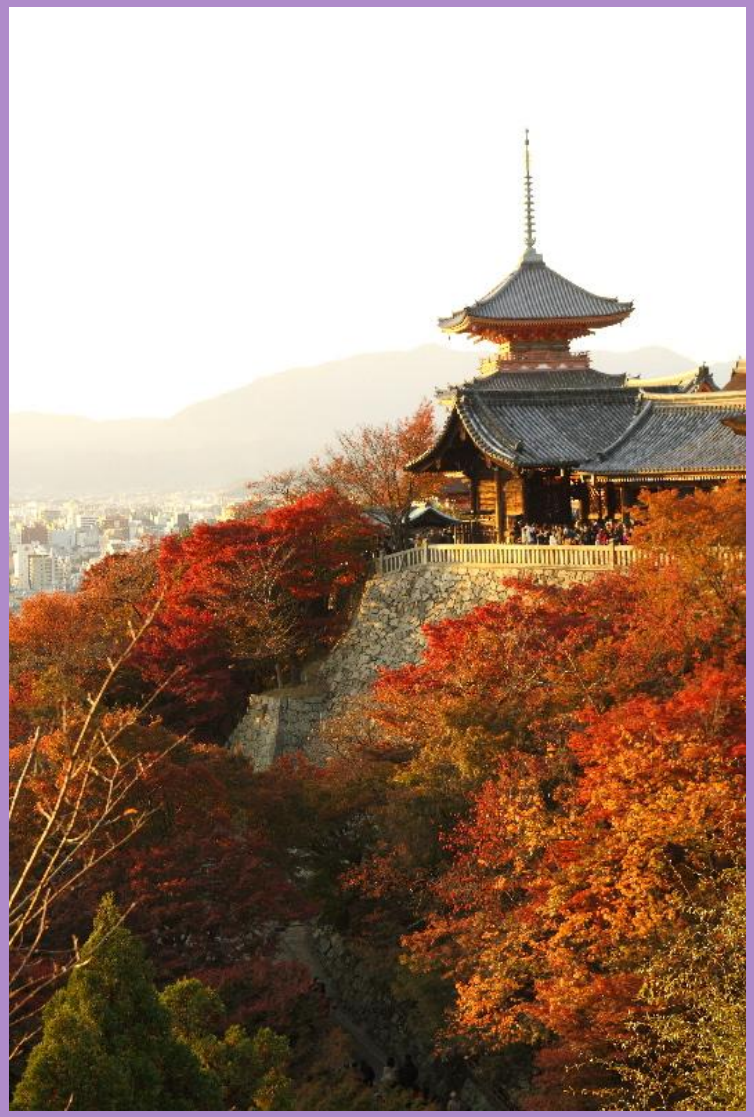
Cumulative emission reduction: 78$MtCO_2$



# Government expenditure



# Kyoto City



# About Kyoto City 2005

- Demography
  - Population 1.47million
  - Household 0.65 million
- Economy
  - GDP  6.1 trillion yen (67Bill.$)
  - Per capita GDP 46100 $
  - Industrial structure  p:s:t = 0.2 : 28 : 71
- GHG emissions  8015 ktCO2 (5.5t$CO_2$/capita)

- Famous sightseeing place(17 world heritage)

# Sightseeing & Transport

- Convenient transport for:
  - Visitors
  - Pedestrians

→ Public transport

→ Pedestrian, bicycle road

# Landscape policy

- Tall buildings are not allowed

  → “Compact city” can not be an option

# Traditional Buildings & LCS

- Using local wood
  - → Enhance forestry
  - → Increase carbon sink of the forest



# Framework

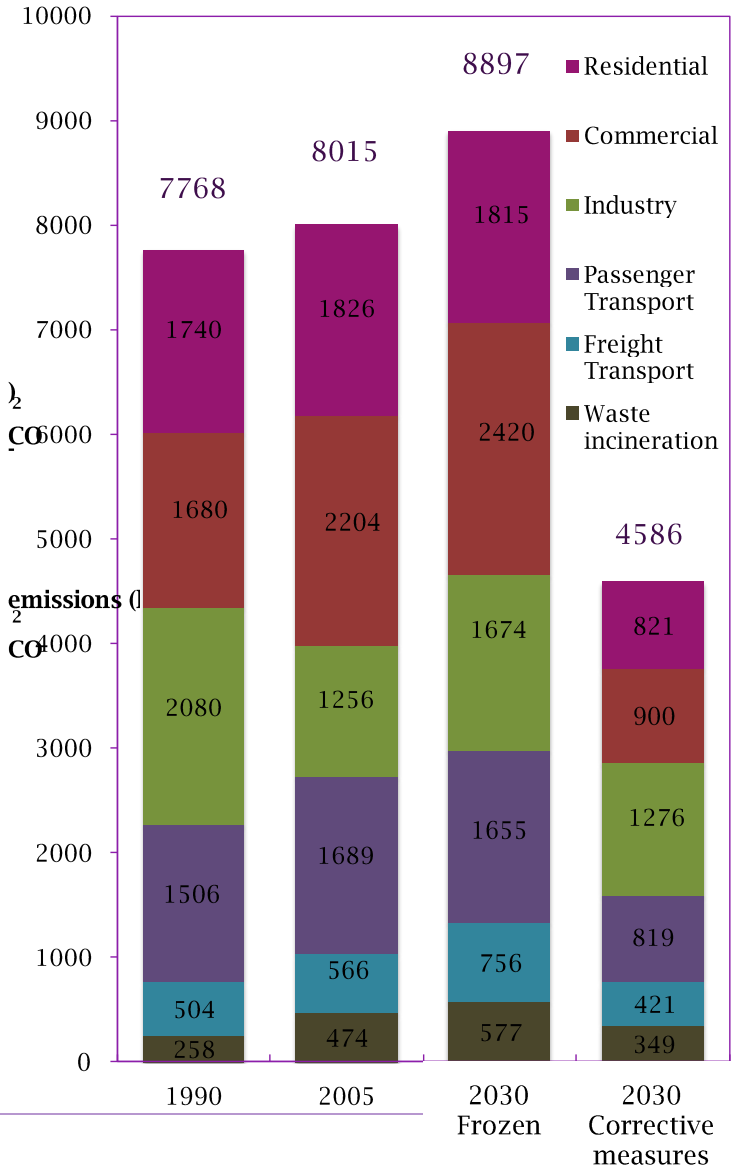
- Base year:  2005
- Target year:  2030

- Low-carbon target: -40% compared to 1990 level

- Two cases:
  - Frozen at current levels case
  - Corrective measures case

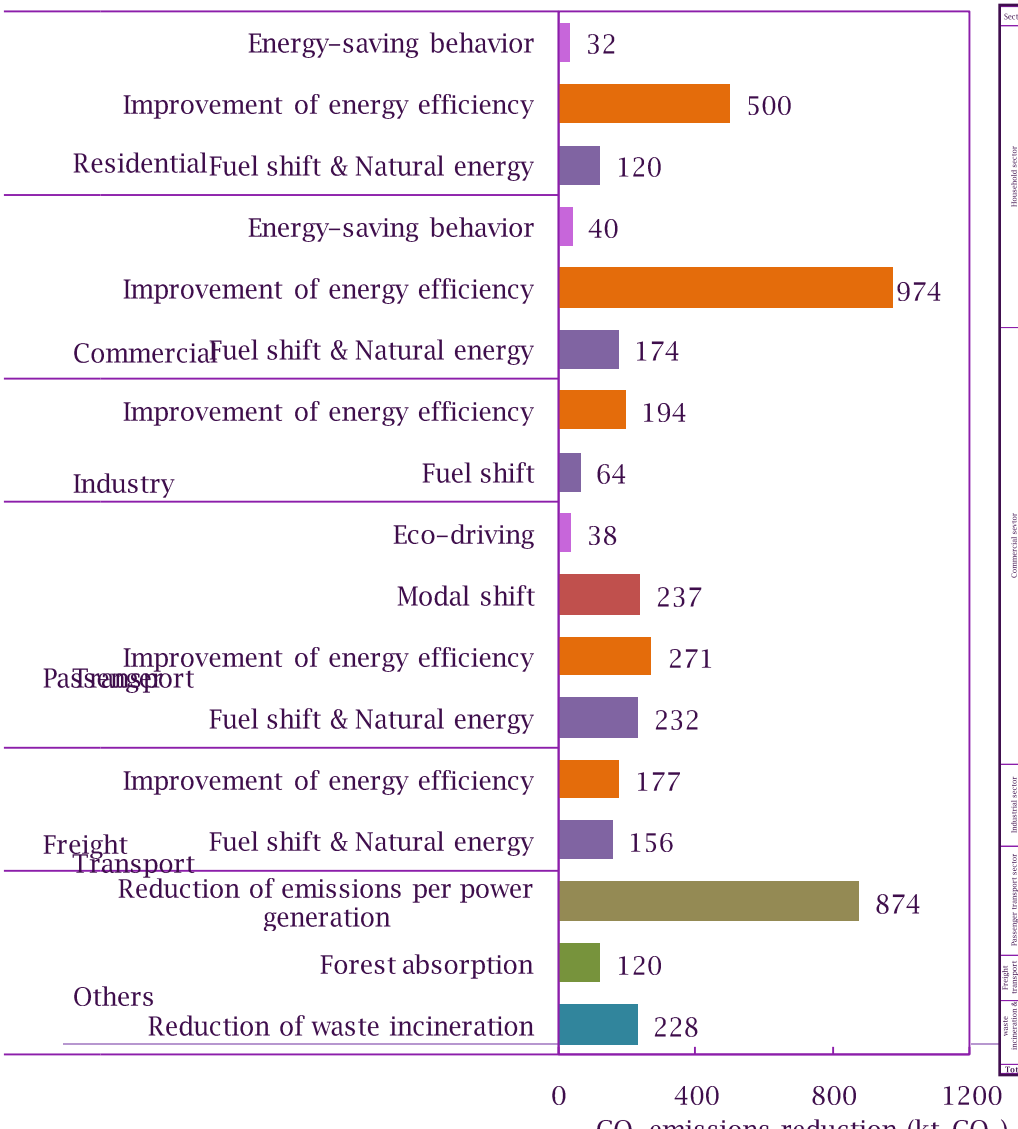
# Snapshot of Kyoto City in 2030

| | 2005 | 2030 | 2030/ 2005 |
|---|---|---|---|
| Population ($10^4$) | 147 | 140 | 0.95 |
| No. of households ($10^4$) | 65 | 65 | 0.99 |
| GDP (bill yen) | 6124 | 8305 | 1.36 |
| GDP per capita (mill yen/capita) | 4.15 | 5.94 | 1.43 |
| Gross output (bill yen) | 9938 | 13400 | 1.35 |
| Primary industry | 17 | 19 | 1.13 |
| Secondary industry | 2735 | 3542 | 1.30 |
| Tertiary industry | 6947 | 9507 | 1.37 |
| Passenger transport (mill p-km) | 9251 | 8192 | 0.89 |
| Freight transport (mill t-km) | 3484 | 4571 | 1.31 |



# Low-carbon direct measures

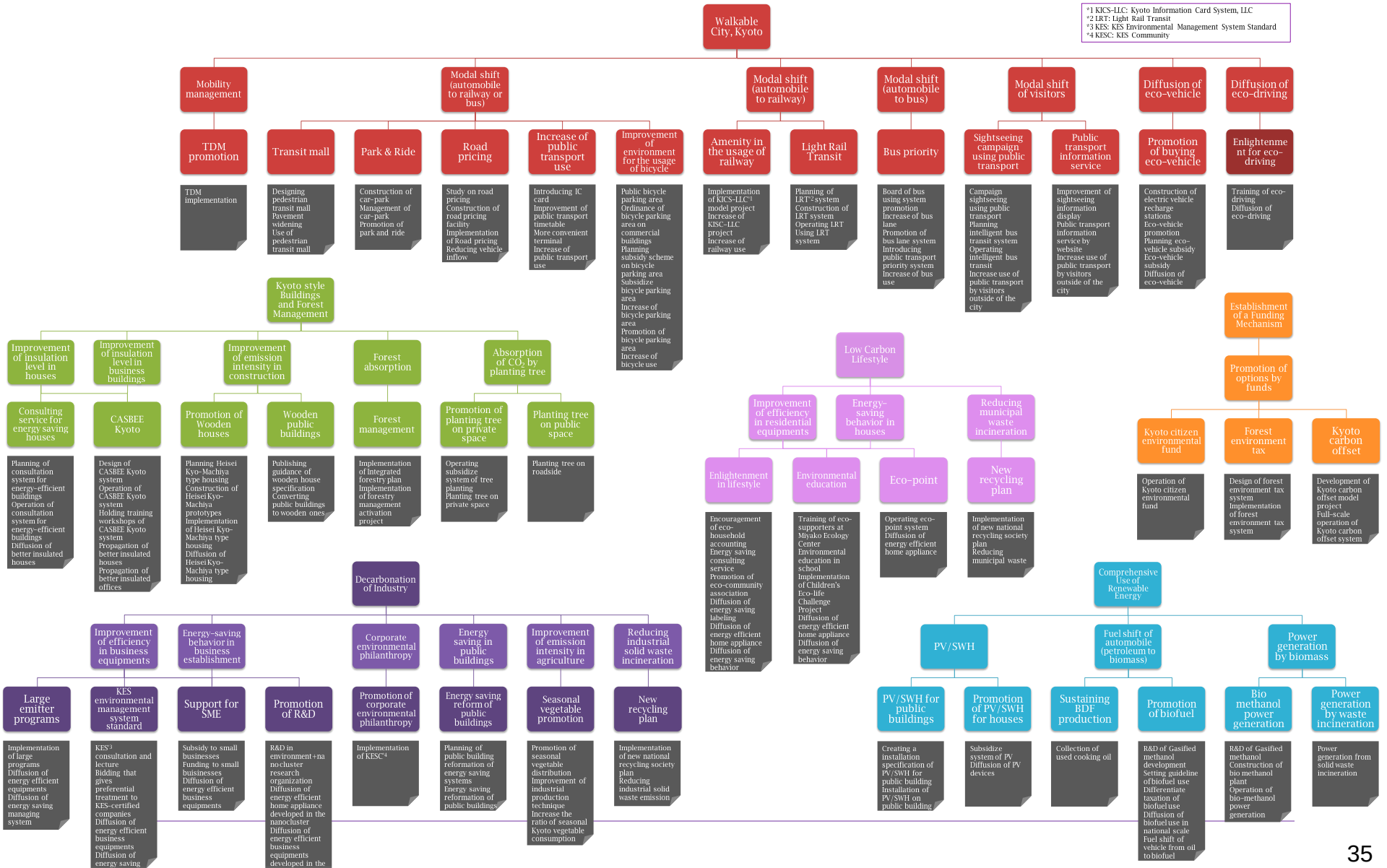
## Contribution to CO2 emissions reduction (compared to Frozen)




## Direct measures

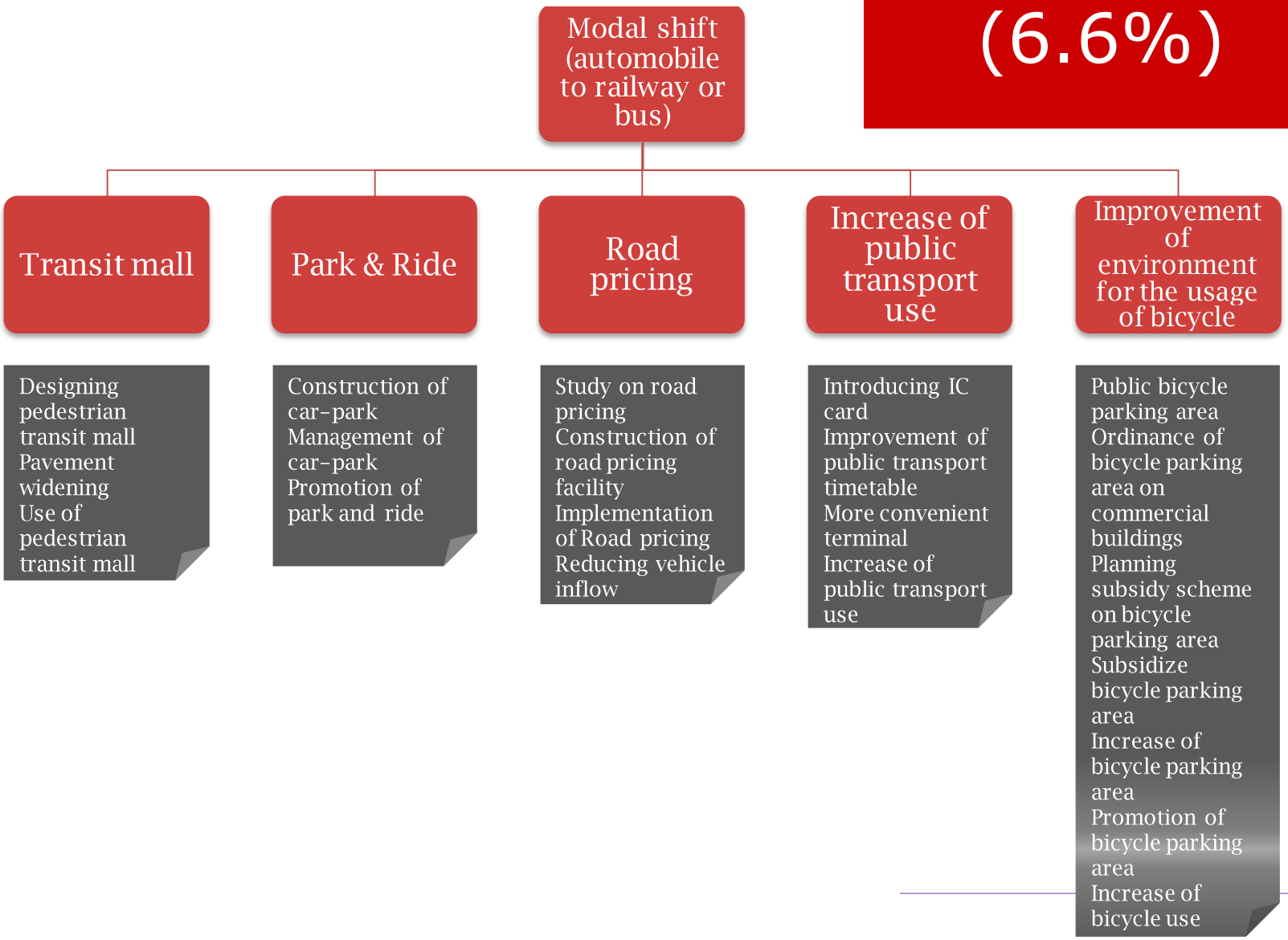
| Sector | Low-carbon countermeasure | Data | | Source | Category (*) | Identified implementation intencity | | Emissions reduction (kt-CO2) | Action (**) |
|---|---|---|---|---|---|---|---|---|---|
| Household sector | Air conditioner | | | | | | | 50.1 | 3(***) |
| | Highest energy efficiency air conditioner | COP | 6.60 | 2 | E | Diffusion ratio (cooling and heating) | 50% | | |
| | High energy efficiency air conditioner | COP | 2.54 | 1 | E | Diffusion ratio (cooling and heating) | 50% | | |
| | High energy efficiency kerosene heating | COP | 0.88 | 1 | E | Diffusion ratio (heating: kerosene) | 80% | 12.9 | 3 |
| | High energy efficiency gas heating | COP | 0.88 | 1 | E | Diffusion ratio (heating: gas) | 80% | 25.8 | 3 |
| | High energy efficiency oil water heater | COP | 0.83 | 1 | E | Diffusion ratio (hot water: oil) | 70% | 6.1 | 3 |
| | Gas water heater | | | | | | | 55.0 | 3 |
| | Latent heat recovery-type water heater | COP | 0.83 | 1 | E | Diffusion ratio (hot water: gas) | 50% | | |
| | High energy efficiency gas water heater | COP | 0.83 | 1 | E | Diffusion ratio (hot water: gas) | 50% | | |
| | Heat pump water heater | COP | 4.50 | 3 | E | Diffusion ratio (hot water: electricity) | 70% | 48.9 | 3 |
| | High energy efficiency gas cooker | Thermal efficiency (base year=1) | 0.55 | 1 | E | Diffusion ratio (cooking: gas) | 70% | 12.3 | 3 |
| | High energy efficiency IH cooker | Thermal efficiency (base year=1) | 0.86 | 1 | E | Diffusion ratio (cooking: electricity) | 70% | 8.0 | 3 |
| | Fluorescent light | | | | | | | 31.9 | 3 |
| | LED (substitute fluorescent light) | Electricity consumption (conventional type=1) | 2.67 | 1 | E | Diffusion ratio | 50% | 24.1 | 3 |
| | HF inverter fluorescent light | Electricity consumption (conventional type=1) | 1.33 | 1 | E | Diffusion ratio | 50% | | |
| | Incandescent light | | | | | | | 51.5 | 3 |
| | LED (substitute incandescent light) | Electricity consumption (conventional type=1) | 8.70 | 1 | E | Diffusion ratio | 50% | | |
| | Bulb-type fluorescent light | Electricity consumption (conventional type=1) | 4.35 | 1 | E | Diffusion ratio | 50% | | |
| | Refrigerator | | | | | | | 72.1 | 3 |
| | Super high energy efficiency refrigerator | Electricity consumption (conventional type=1) | 2.92 | 1 | E | Diffusion ratio | 50% | | |
| | Highest energy efficiency refrigerator | Electricity consumption (conventional type=1) | 2.33 | 1 | E | Diffusion ratio | 50% | | |
| | TV | | | | | | | 31.9 | 3 |
| | LCD TV | Electricity consumption (conventional type=1) | 2.27 | 1 | E | Diffusion ratio | 50% | | |
| | Highest energy efficiency TV | Electricity consumption (conventional type=1) | 1.54 | 1 | E | Diffusion ratio | 50% | | |
| | House insulation | | | | | | | 100.7 | 2 |
| | Next generation level | Thermal loss (base year=1) | 0.36 | 4 | E | Diffusion ratio | 40% | | |
| | New standard | Thermal loss (base year=1) | 0.43 | 4 | E | Diffusion ratio | 40% | | |
| | Energy-saving behavior | Energy service demand reduction ratio | 10% | 5 | B | Diffusion ratio | 25% | 32.4 | 3 |
| | Photovoltaic generation | Potential(ktoe) | 295 | 6 | S | Diffusion ratio | 10% | 26.9 | 5 |
| | Solar water heating | Potential(ktoe) | 1037 | 6 | S | Diffusion ratio (hot water: all) | 10% | 38.8 | 5 |
| | Other energy efficiency improvement | | | | E | | | 0.2 | 3 |
| | Other fuel shifting | | | | S | | | 27.3 | 3 |
| | **Total** | | | | | | | **625.1** | |
| Commercial sector | Air conditioner (cooling only) | | | | | | | 41.3 | 4 |
| | Super high energy efficiency air conditioner (cooling only) | COP | 5.00 | 2 | E | Diffusion ratio (cooling: electricity) | 50% | | |
| | Highest energy efficiency air conditioner (cooling only) | COP | 4.07 | 1 | E | Diffusion ratio (cooling: electricity) | 50% | | |
| | Cooling (gas) | | | | | | | 19.1 | 4 |
| | High energy efficiency gas heat pump | COP | 1.60 | 8 | E | Diffusion ratio (cooling: gas) | 40% | | |
| | High energy efficiency absorption tiller (gas) | COP | 1.35 | 7 | E | Diffusion ratio (cooling: gas) | 40% | | |
| | High energy efficiency absorption tiller(oil) | COP | 1.35 | 9 | E | Diffusion ratio (cooling: oil) | 70% | 3.2 | 4 |
| | High energy efficiency boiler (oil) | COP | 0.88 | 1 | E | Diffusion ratio (heating: oil) | 70% | 25.1 | 4 |
| | High energy efficiency boiler (gas) | COP | 0.88 | 1 | E | Diffusion ratio (heating: gas) | 70% | 75.4 | 4 |
| | Air conditioner (heating only) | | | | | | | 67.0 | 4 |
| | Super high energy efficiency air conditioner (heating only) | COP | 7.40 | 2 | E | Diffusion ratio (heating: electricity) | 90% | | |
| | Highest energy efficiency air conditioner (heating only) | COP | 4.44 | 1 | E | Diffusion ratio (heating electricity) | 10% | | |
| | High energy efficiency oil water heater | COP | 0.87 | 1 | E | Diffusion ratio (hot water: oil) | 70% | 16.0 | 4 |
| | Gas water heater | | | | | | | 64.2 | 4 |
| | High energy efficiency gas waterheater | COP | 0.87 | 1 | E | Diffusion ratio (hot water: gas) | 50% | | |
| | Latent heat recovery-type water heater | COP | 0.85 | 1 | E | Diffusion ratio (hot water: gas) | 50% | | |
| | $CO_2$ cooling medium water heater | COP | 3.00 | 1 | E | Diffusion ratio (hot water: electricity) | 100% | 64.2 | 4 |
| | High energy efficiency gas cooker | Thermal efficiency (base year=1) | 0.55 | 1 | E | Diffusion ratio (cooking: gas) | 70% | 27.0 | 4 |
| | IH cooking heater | Thermal efficiency (base year=1) | 0.86 | 1 | E | Diffusion ratio (cooking: electricity) | 70% | 11.6 | 4 |
| | Incandescent light | | | | | | | 131.6 | 4 |
| | Timer controlled LED(substitute fluorescent light) | Electricity consumption (conventional type=1) | 3.95 | 1 | E | Diffusion ratio | 50% | | |
| | Illumination controlled LED (substitute fluorescent light) | Electricity consumption (conventional type=1) | 3.36 | 1 | E | Diffusion ratio | 50% | | |
| | Incandescent light | | | | | | | 20.6 | 4 |
| | LED (substitute incandescent light) | Electricity consumption (conventional type=1) | 4.55 | 1 | E | Diffusion ratio | 50% | | |
| | Bulb-type fluorescent light | Electricity consumption (conventional type=1) | 4.55 | 1 | E | Diffusion ratio | 50% | | |
| | High-intensity evacuation light | Electricity consumption (conventional type=1) | 4.18 | 1 | E | Diffusion ratio | 70% | 0.5 | 4 |
| | Large scale computer (energy-saving type) | Electricity consumption (conventional type=1) | 1.18 | 1 | E | Diffusion ratio | 70% | 3.1 | 4 |
| | Personal computer (energy-saving type) | Electricity consumption (conventional type=1) | 2.47 | 1 | E | Diffusion ratio | 70% | 3.3 | 4 |
| | Copier (energy-saving type) | Electricity consumption (conventional type=1) | 1.45 | 1 | E | Diffusion ratio | 70% | 0.9 | 4 |
| | Fax machine (energy-saving type) | Electricity consumption (conventional type=1) | 1.45 | 1 | E | Diffusion ratio | 70% | 0.6 | 4 |
| | Printer (energy-saving type) | Electricity consumption (conventional type=1) | 1.45 | 1 | E | Diffusion ratio | 70% | 1.2 | 4 |
| | Elevator (energy-saving type) | Electricity consumption (conventional type=1) | 4.01 | 1 | E | Diffusion ratio | 70% | 5.4 | 4 |
| | Ventilation | | | | | | | 50.1 | 4 |
| | with energy-saving fan | Electricity consumption (conventional type=1) | 2.00 | 1 | E | Diffusion ratio | 50% | | |
| | with low-pressure duct | Electricity consumption (conventional type=1) | 1.82 | 1 | E | Diffusion ratio | 50% | | |
| | Vending machine (energy-saving type) | Electricity consumption (conventional type=1) | 2.17 | 1 | E | Diffusion ratio | 70% | 11.5 | 4 |
| | Traffic light (LED type) | Electricity consumption (conventional type=1) | 3.75 | 1 | E | Diffusion ratio | 70% | 1.4 | 4 |
| | High energy efficiency transformer | Electricity consumption (conventional type=1) | 2.53 | 1 | E | Diffusion ratio | 70% | 13.3 | 4 |
| | Other electric appliances | | | | | | | 61.2 | 4 |
| | 30% energy-saving type | Electricity consumption (conventional type=1) | 1.43 | 1 | E | Diffusion ratio | 50% | | |
| | 10% energy-saving type | Electricity consumption (conventional type=1) | 1.11 | 1 | E | Diffusion ratio | 50% | | |
| | Building insulation | Thermal loss (base year=1) | 0.50 | 1 | E | Diffusion ratio | 100% | 231.1 | 2 |
| | BEMS | Energy demand reduction ratio | 10% | 10 | E | Diffusion ratio | 25% | 24.4 | 4 |
| | Energy-saving behavior | Energy service demand reduction ratio | 10% | 5 | B | Diffusion ratio | 25% | 40.3 | 4 |
| | Photovoltaic generation | Potential(ktoe) | 295 | 6 | S | Diffusion ratio | 10% | 26.9 | 5 |
| | Solar water heating | Potential(ktoe) | 1037 | 6 | S | Diffusion ratio (hot water: all) | 5% | 49.6 | 5 |
| | Other fuel shifting | | | | S | | | 70.8 | 4 |
| | **Total** | | | | | | | **1161.8** | |
| Industrial sector | Energy efficient equipments | | | | E | | | 184.7 | 4 |
| | High energy efficiency boiler | Thermal efficiencybase year=1) | 1.09 | 11 | | Diffusion ratio | 80% | | |
| | High energy efficiency furnace | Thermal efficiencybase year=1) | 1.67 | 12 | | Diffusion ratio | 80% | | |
| | High energy efficiency morter | Electricity consumptionbase year=1) | 1.25 | 11 | | Diffusion ratio | 80% | | |
| | Inverter control | Electricity consumptionbase year=1) | 1.05 | 11 | | Diffusion ratio | 80% | | |
| | Fuel shifting | From oil to gas | | | S | Shifting ratio | 60% | 63.9 | 4 |
| | Increase in the ratio of seasonal vegetable production | Ratio of CO2 emissions against non-seasonal vegitable produc | 0.7 | 17 | E | Ratio of selling seasonal vegitables | 36.2% | 0.3 | 4 |
| | Increase in the ratio of wooden buildings | Ratio of CO2 emissions against non-wooden buildings | 0.6 | 17 | E | Diffusion ratio | 30% | 9.0 | 4 |
| | **Total** | | | | | | | **257.9** | |
| Passenger transport sector | Vehicle | | | | | | | 270.7 | 1 |
| | Hybrid vehicle | Fuel cost (conventional type=1) | 0.6 | 1 | E | Diffusion ratio | 50% | | |
| | High energy efficiency vehicle | Fuel cost (conventional type=1) | 0.8 | 1 | E | Diffusion ratio | 50% | | |
| | Modal shift | From vehicle to: | | | B | | | 236.7 | 1 |
| | Intra area trip | walking and bicycle | | | | Shifting ratio | 15% | | |
| | | train and bas | | | | Shifting ratio | 30% | | |
| | Inter area trip | bicycle | | | | Shifting ratio | 10% | | |
| | | train and bas | | | | Shifting ratio | 30% | | |
| | Trip to outside of the city | train | | | | Shifting ratio | 30% | | |
| | Bio fuel | From oil to bio fuel | | | S | Diffusion ratio | 20% | 231.7 | 5 |
| | Eco-driving | Fuel efficiency improvement ratio | 24% | 13 | B | Diffusion ratio | 20% | 37.8 | 1 |
| | **Total** | | | | | | | **776.9** | |
| Freight transport sector | Vehicle | | | | | | | 176.9 | 1 |
| | Hybrid vehicle | Fuel cost (conventional type=1) | 0.6 | 1 | E | Diffusion ratio | 50% | | |
| | High energy efficiency vehicle | Fuel cost (conventional type=1) | 0.8 | 1 | E | Diffusion ratio | 50% | | |
| | Bio fuel | From oil to bio fuel | | | S | Diffusion ratio | 20% | 156.2 | 5 |
| | **Total** | | | | | | | **333.1** | |
| waste incineration sector | Bio-methanol power generation | | | 17 | | production of electricity (ktoe) | 18.8 | 53.8 | 5 |
| | Reducing the amount of waste incineration | | | 17 | | Rate of $CO_2$ emissions reduction | 40% | 228.1 | 3, 4 |
| | Improvement of $CO_2$ intensity of power generation | | | | | $CO_2$ emission per generation (tC/toe) | 0.78 | 873.9 | (****) |
| | Fuel shifting | | | 14 | | | | | |
| | Generation efficiency improvement | | | | | | | | |
| | Coal | Generation efficiency | 48% | 15 | | | | | |
| | Gas | Generation efficiency | 53% | 16 | | | | | |
| Total | | | | | | | | **4310.7** | |

# Low-carbon measures



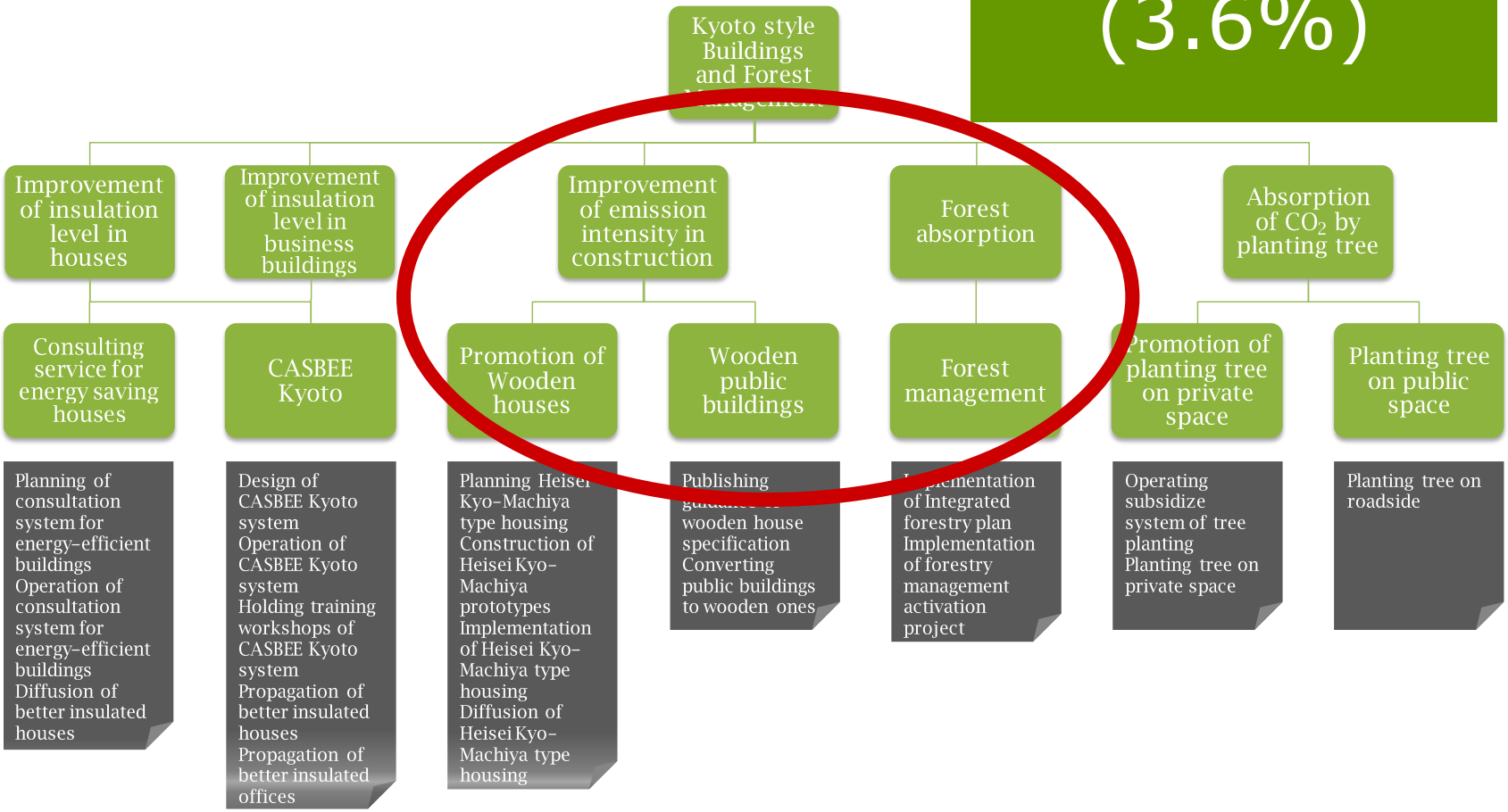
# Modal shift

**237ktCO$_2$ (6.6%)**

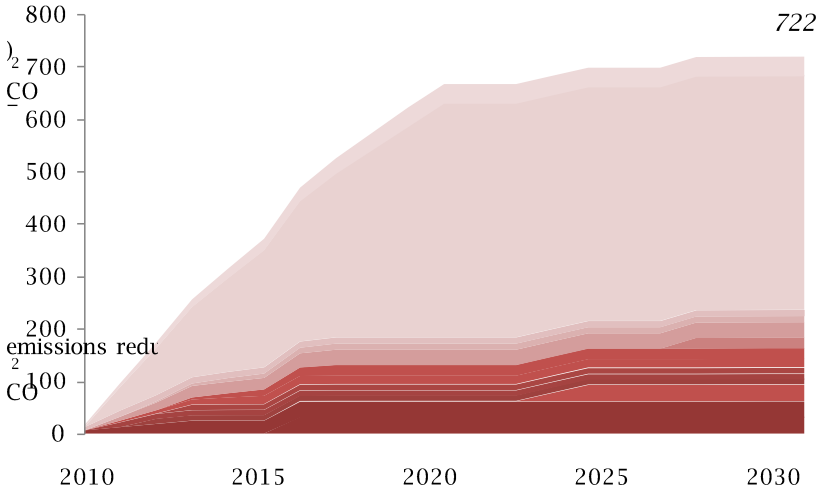


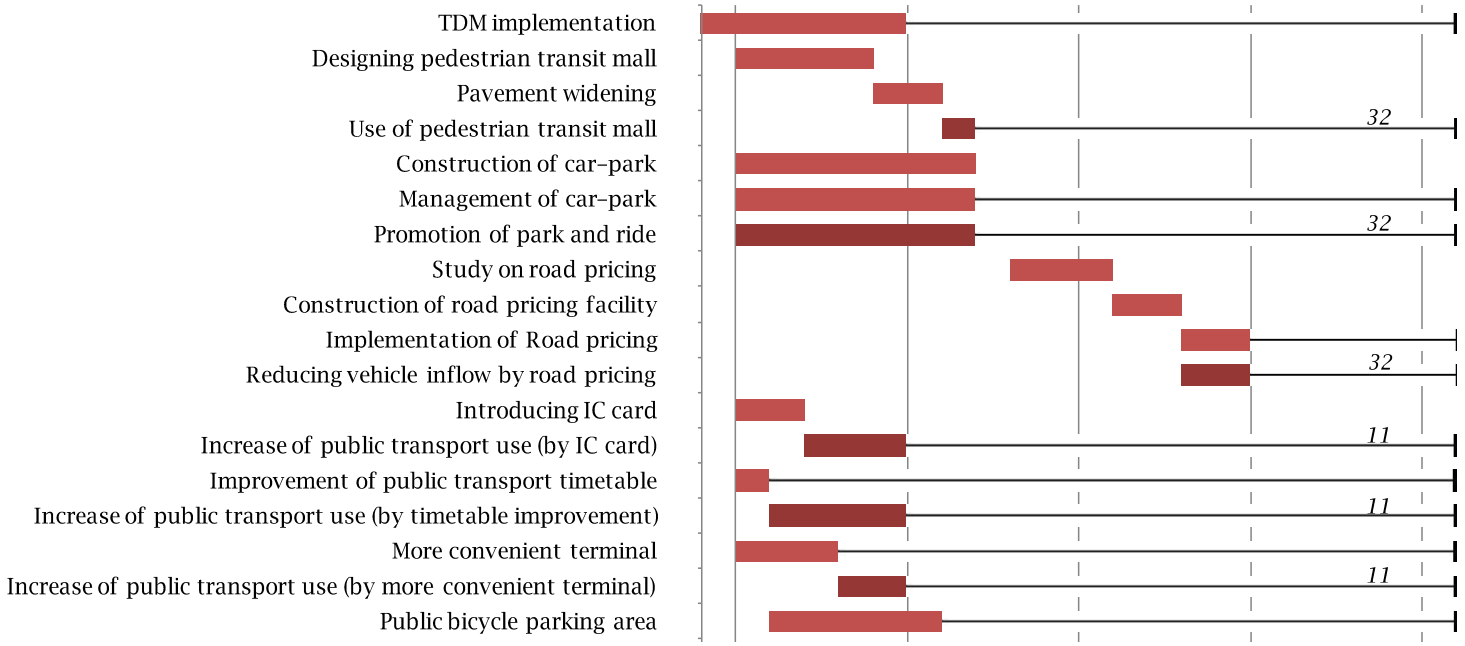
# Forest carbon sink

**129kt$CO_2$ (3.6%)**



# Action 1 Workable city, Kyoto



# Action 1 Workable city, Kyoto

# Conclusion

- ExSS & BCT can be utilized according to the needs of the city/region
- In Shiga pref.,
  - ExSS was extended to three environmental Goals.
  - Budget constraints were considered in BCT
- In Kyoto city, Landscape & Sightseeing policies were considered