



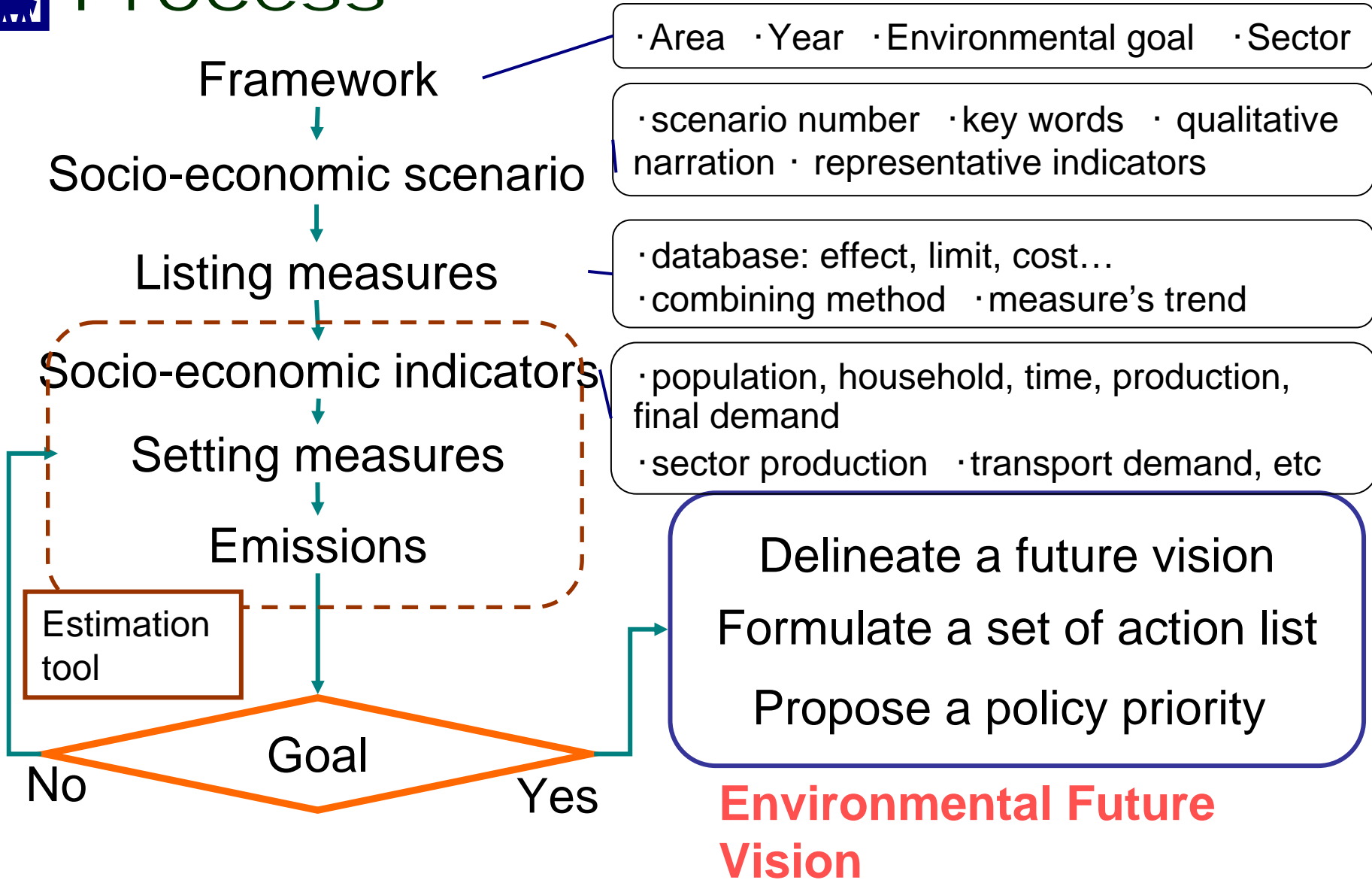
Purpose of the Study

- Propose a method to formulate a future environmental vision
- Develop a set of tool to estimate a quantitative and consistent socio-economic future and its consequence
- Apply the tool to Shiga Prefecture



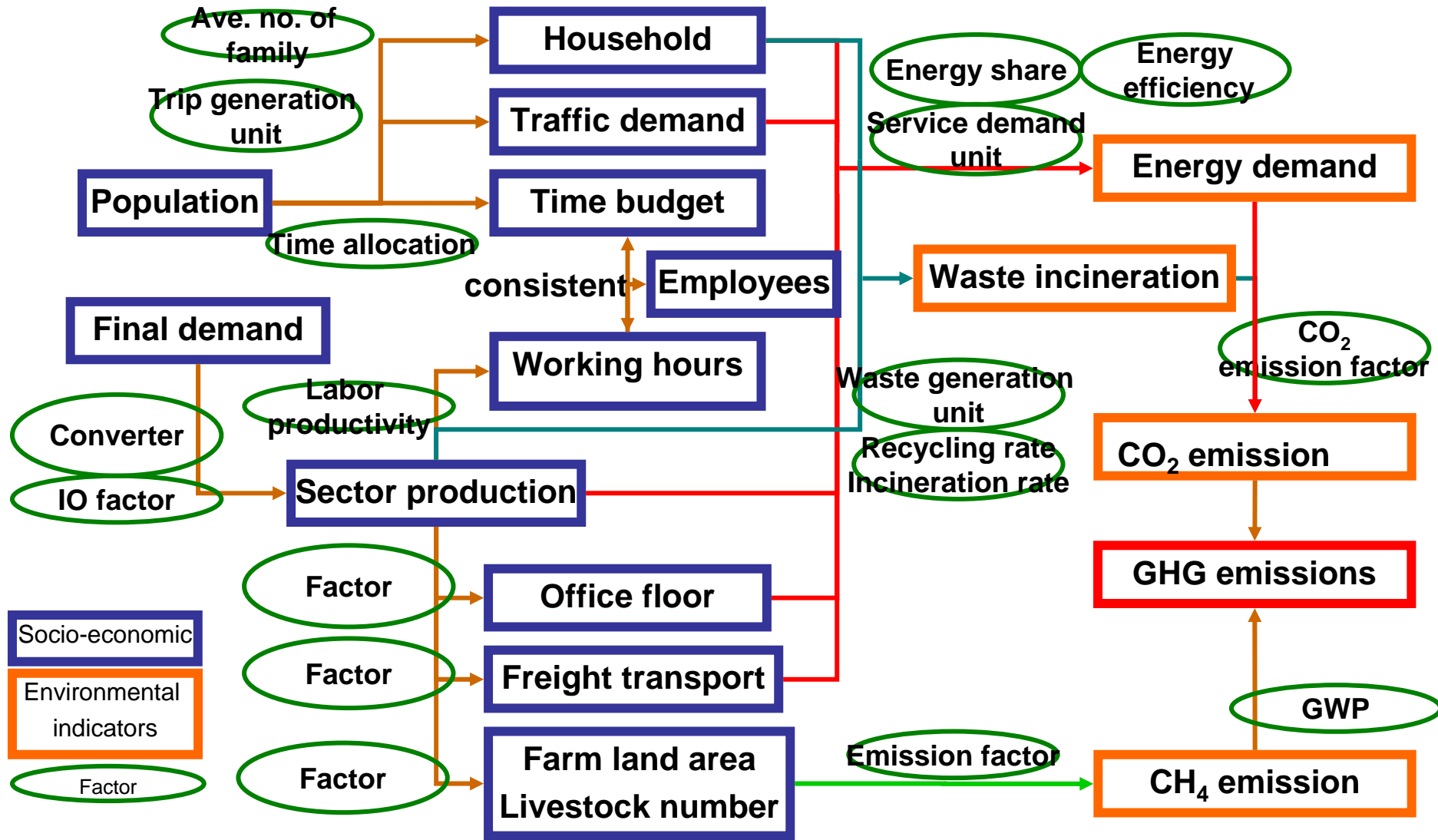


Process



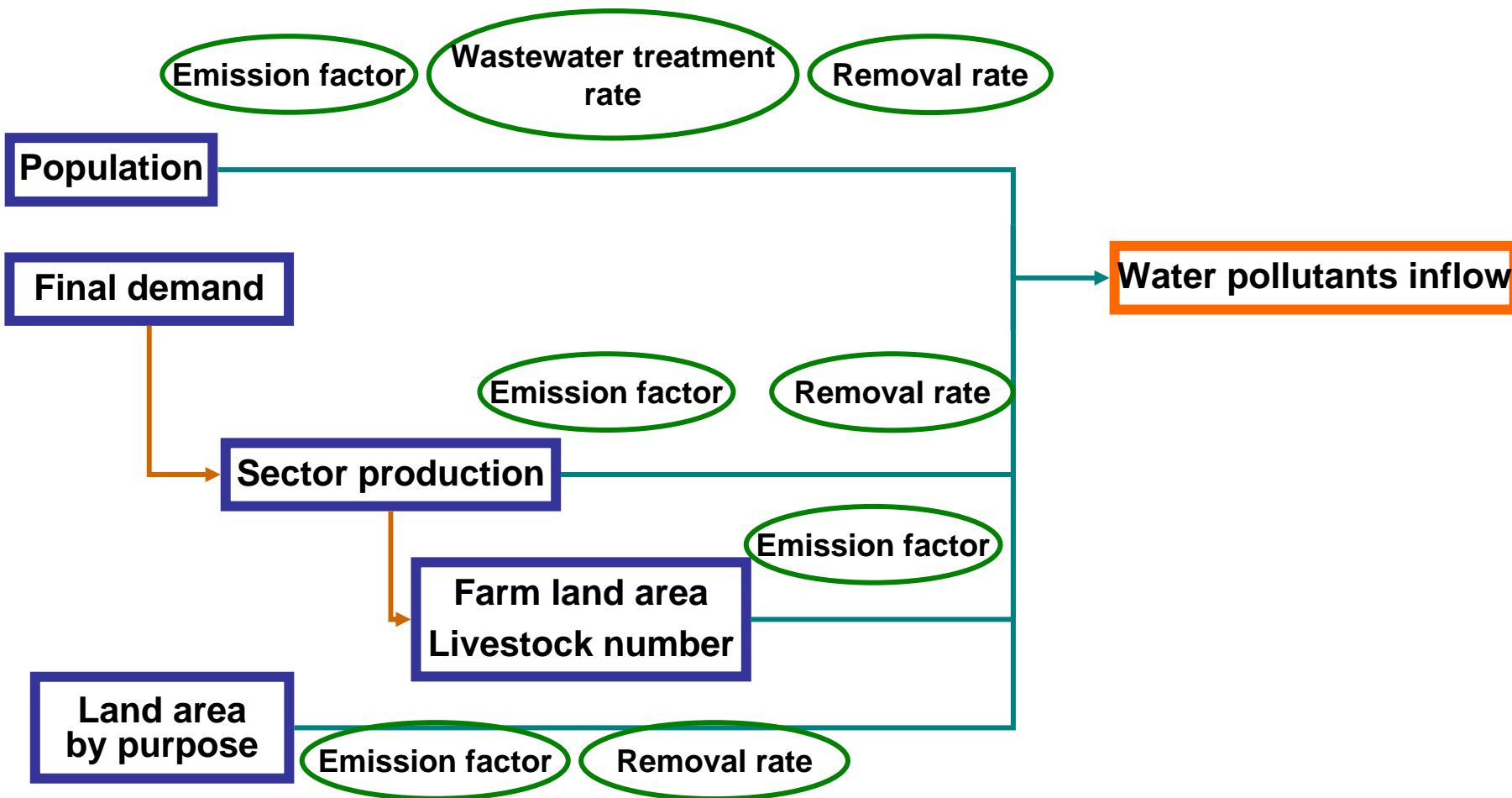


Estimation flow: socio-economic indicators and GHG emissions





Estimating flow: water pollution





Area and Target year

- Area : Shiga Prefecture
 - Population : approx. 1.38 million (2006)
1% of Japan
 - Area : approx. 4000km² 1% of Japan
 - Lake Biwa : approx. 670 km²
1/6 of Shiga

- Target Year : 2030
 - Target year of next prefectural long-term plan



Location of Shiga Prefecture





Overview of Shiga Prefecture

Area: 4,017 km²

- Lake Biwa: 670 km² (17%)

Population: 1,387,475 ('06)

- Only one pref. where the population would increase until 2030

Households: 499,716 ('06)

Share of Secondary Ind. (GDP): 46.7% ('02)

- Largest share in Japan.





Environmental Goal

- GHG(CO₂, CH₄) : **-40%** from 1990 level
 - Considering the necessity of 60~80% reduction from 1990 level by 2050 in Japan
- Water quality in Lake Biwa : Environmental Quality Standards
 - COD : **3**, TN : **0.2**, TP:**0.01** mg/L
 - Targeting allowable water pollutants inflow to Lake Biwa





Scenario Keywords and Quantification

	A	B
Philosophy	Competition, Business performance, Economic growth	Spiritual happiness, Redistribution, International contribution
Lifestyle	Individualism, Externalization of household cares, Hard working	Family and community oriented, participation in social activity
Eco consciousness	low	high
Tech. innovation	fast	slow
National GDP growth/capita	approx. 2% /year	approx. 1% /year
Private consumption expenditure	Primary : 0.6% Secondary : 10.4% Tertiary : 89.0%	Primary : 3.8% Secondary : 15.2% Tertiary : 81.0%





Countermeasures : GHGs

Residential and
Service

Energy efficiency improvement
Fuel switch including renewable
Lifestyle change

Industrial

Energy efficiency improvement
Fuel switch

Transport

Energy efficiency improvement
Traffic modal shift: public
transport, bicycle
Fuel switch to bio-fuel
Compact city, Logistic efficiency

Other

Recycling rate improvement
Forest management





Countermeasures : Water pollutants

Household	Kitchen management Toilet separating human waste and urine
Municipal wastewater	Advanced treatment system by O ₃ and activated carbon Soil trench
Non point source	Treatment system of flush-out rain Permeable pavement
Industrial	Connection to treatment systems
Agriculture and Forestry	Livestock waste return to farm land, Reducing fertilizer, Forest management
River	On-site treatment, Restoration of ponds
Others	Air quality improvement, Vegetation





Scenario and Environmental measure

	A	B
Trend	Technology oriented Social infrastructure	Tech. & behavior Natural system
GHGs reduction	Energy efficiency improvement in machine & apparatus Compact city Nuclear power	Renewable energy Traffic modal shift Energy conservation Forest management
Water pollutants reduction	Infrastructure: sewage plants, on-site plants Advanced treatment	Kitchen management Forest management Eco-friendly agriculture





Result: Socio-economic indicators

- Real GDP growth A : **1.5%/year** B : **0.7%/year**
- A: Secondary industry production: **1.5** times than 2000
- B: Primary industry production: **2.9** times than 2000

	2000年	A	B	A/2000年	B/2000年
Population (thousand)	1342	1381	1381	1.03	1.03
Real GDP (billion)	5884	9022	7311	1.53	1.24
Industrial production (billion)					
Primary industry	95	94	276	0.99	2.89
Secondary industry	7220	10510	8036	1.46	1.11
Tertiary industry	4269	6883	5627	1.61	1.32
Office floor area (1000m ²)	20126	30681	24152	1.52	1.20
Passenger transport (million p·km)	10918	15579	16101	1.43	1.47
Freight transport (million t·km)	4072	4921	4220	1.21	1.04





Result: Environmental measures

		A	B
GHGs	Industrial energy efficiency improvement ratio (compared to 2000)	1.35	1.26
	Eco-conscious behavior implementation rate (household)	10%	80%
	PV generation diffusion rate	10%	22%
	Modal shift in passenger transport (within the area)		
	automobile → rail	20%	40%
	automobile → bicycle	10%	12%
	Hybrid vehicle diffusion rate	98%	40%
Water	Sewer diffusion rate	100%	49%
	Advanced treatment diffusion rate	100%	80%
	Fertilizer reduction diffusion rate	30%	100%
	Diffusion of flushout rain treatment	100%	50%

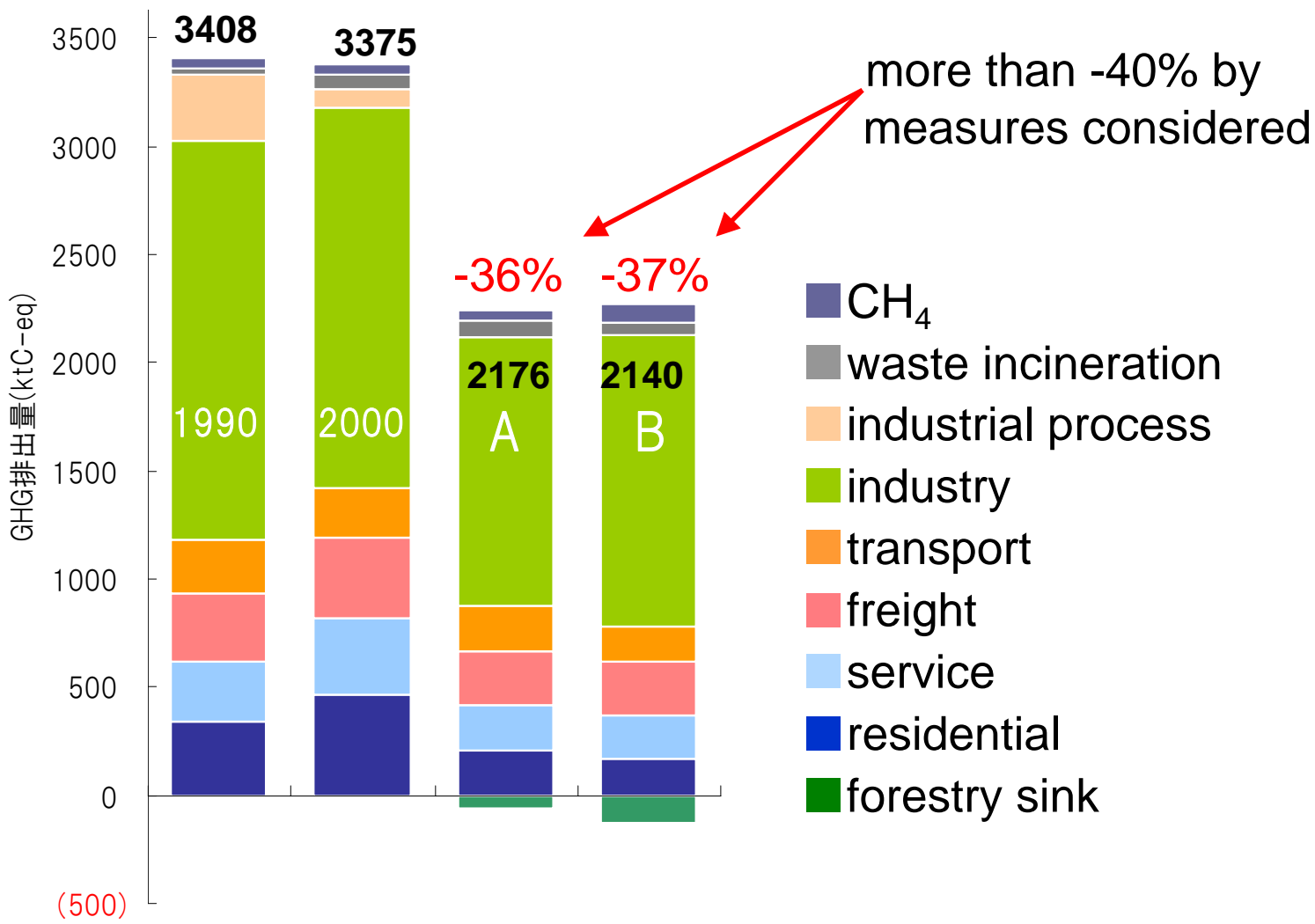
Intensive measures :

- GHGs
 - A : energy efficiency imp.
 - B : behavior change, modal shift
- Water pollutants
 - A : sewage plants
 - B : eco-friendly agriculture





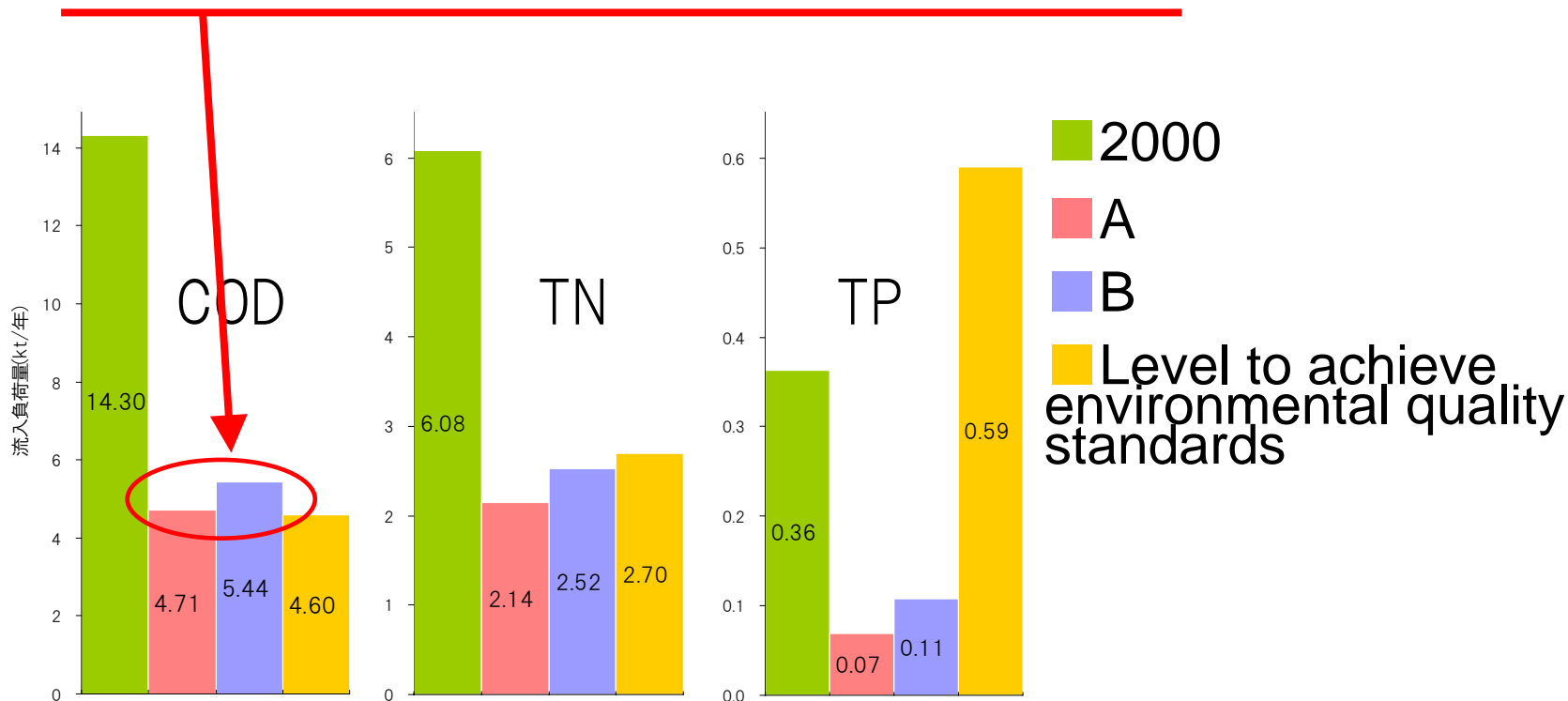
Result: GHG emissions





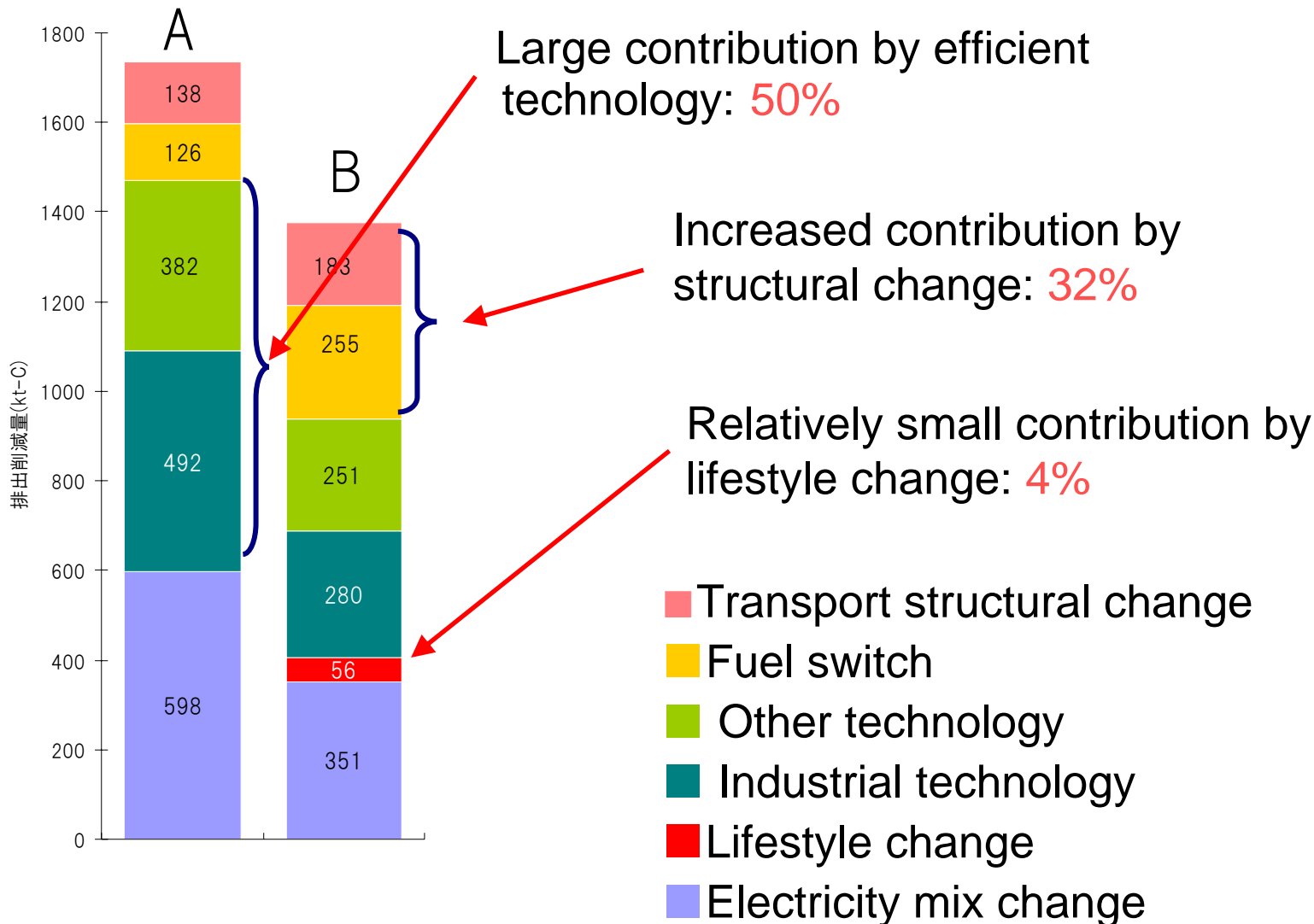
Result: Water pollutants inflow

- Achieve the goals of TN and TP
- COD: 2% excess in A, 18% excess in B





CO₂ reduction by measure





Conclusion

- Developed a tool to estimate socio-economic indicators and environmental emissions
- Applied it to Shiga prefecture using two scenarios
- Evaluated the effects of measures based upon future socio-economic indicators
- To be used in the policy discussion among Shiga Prefecture
- Future task: cost estimation, back-casting

