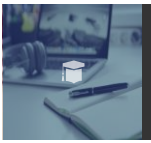
Based on Transport Model Choice Transfer to Promote Environment Benefits

交通手段選択モデルに基づく環境保護の提案

Team C

Waseda University



Background & Objectives

Background

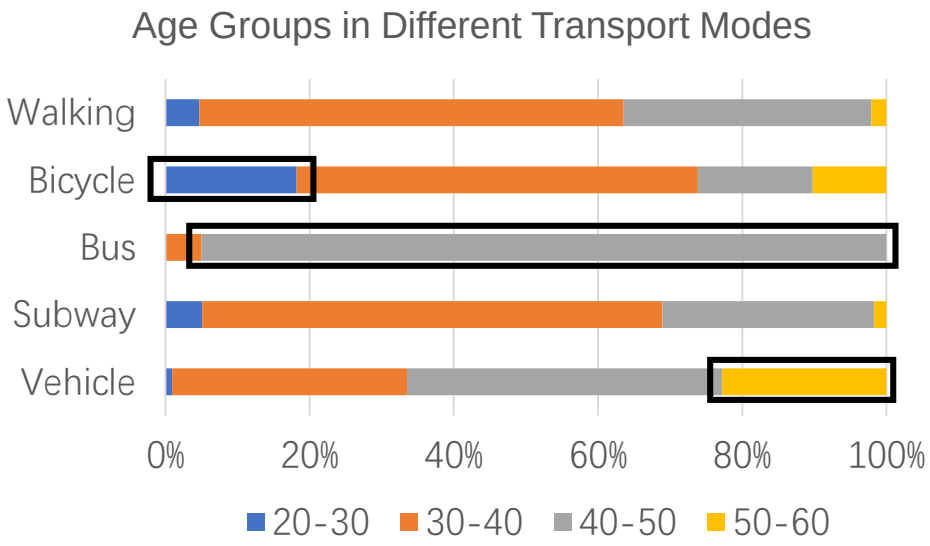
- Approximately 20% of greenhouse gas emissions in Yokohama are caused by the transportation sector, half of which can be attributed to private cars (Hino et al., 2019).
- Sustainable Development Goals (SDGs) in Yokohama (City of Yokohama, 2018).

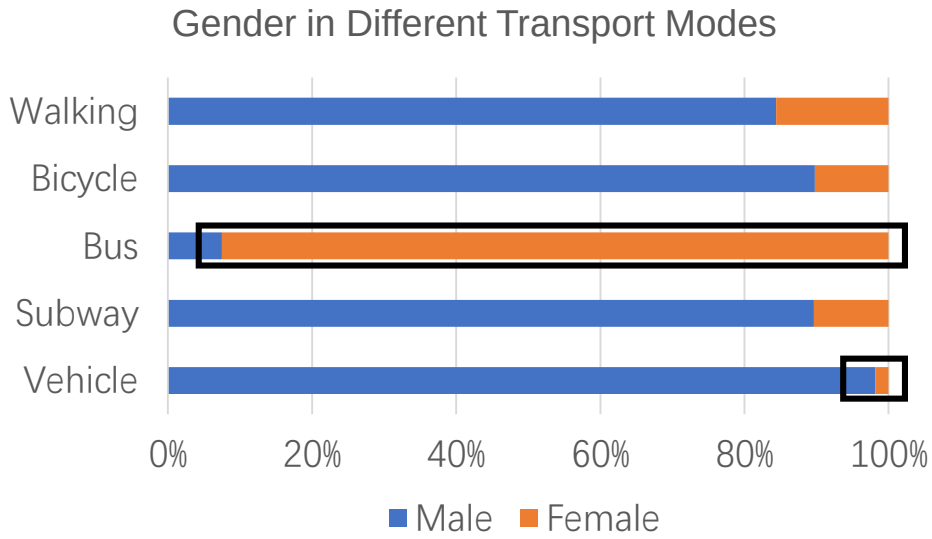
Objectives

- Encourage low carbon travel in Yokohama.
- Offset carbon emission by policy insights.

Basic aggregation

Personal information (YOKOHAMA 2008 PP Data)

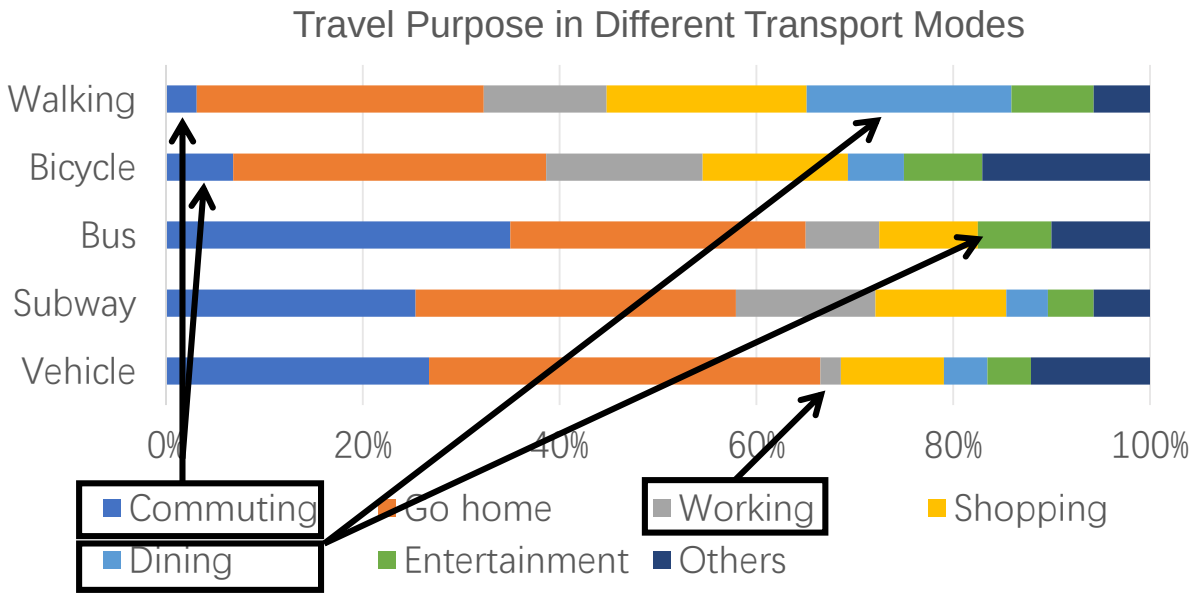


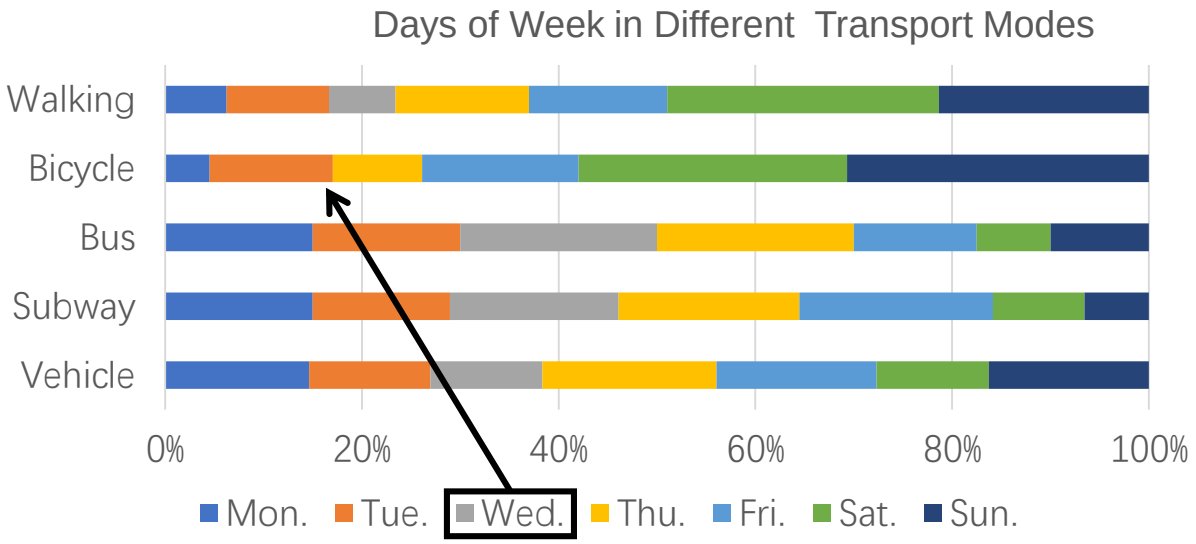


- 31 respondents
- 1223 trips
- Age range: 28~54

Basic aggregation

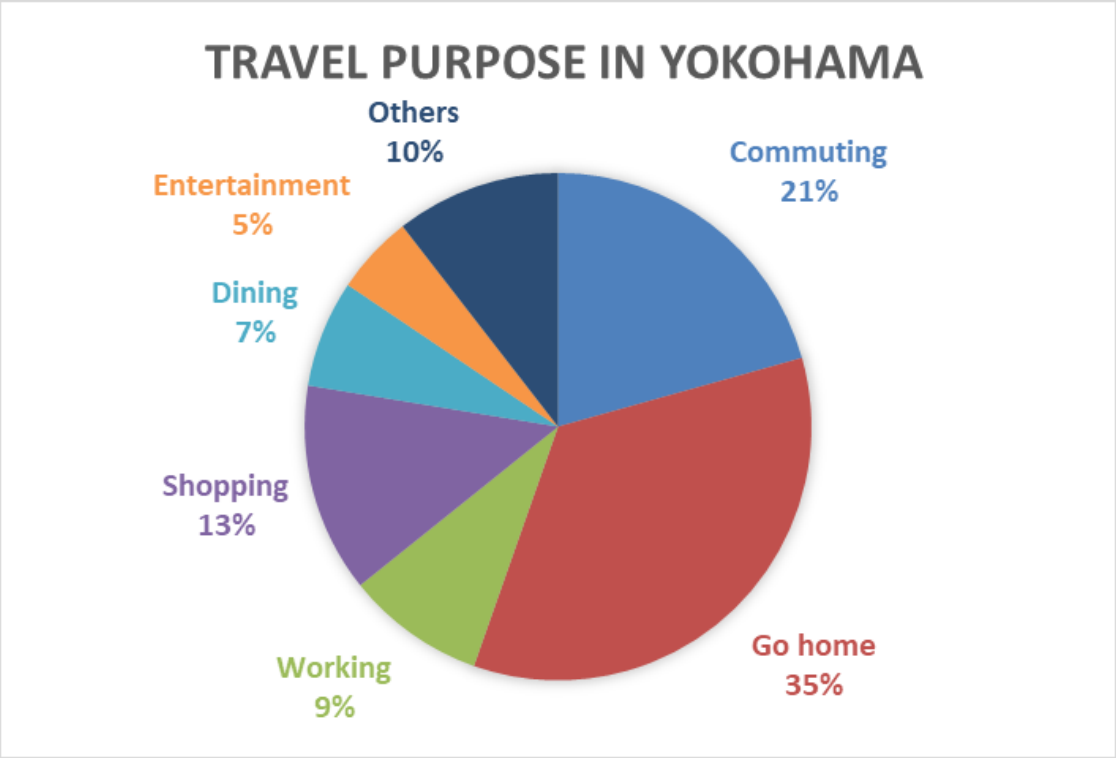
Travel Purpose & Days of Week in Different Transport Modes

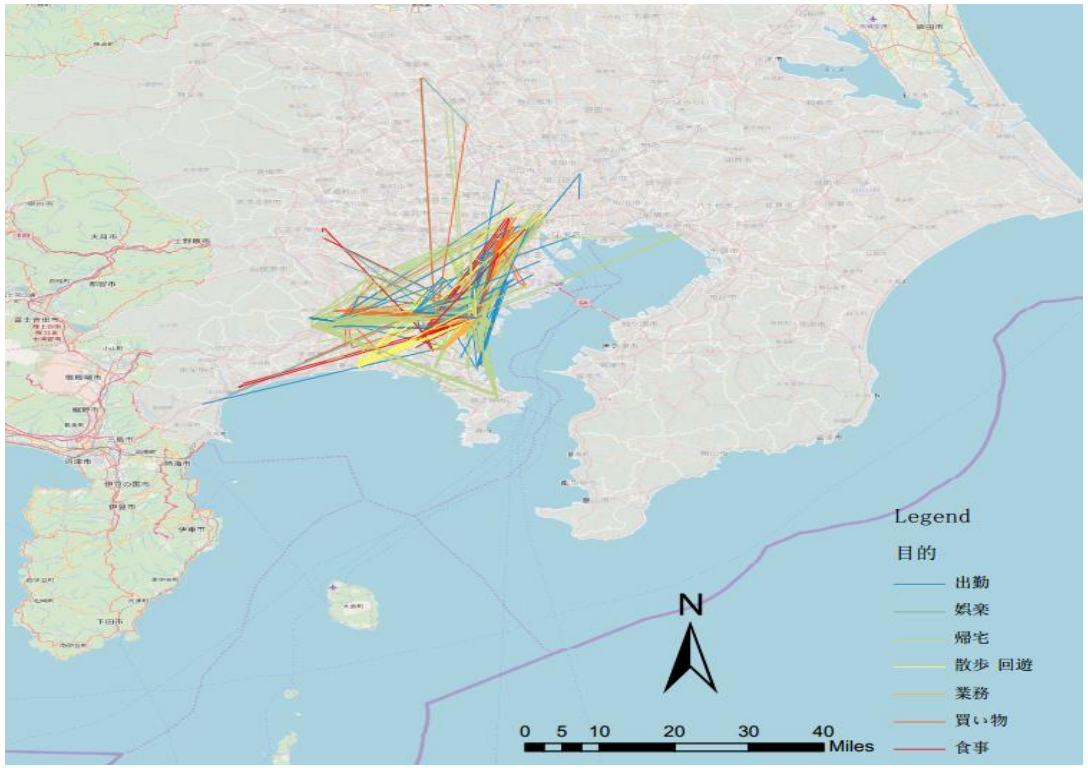




Basic aggregation

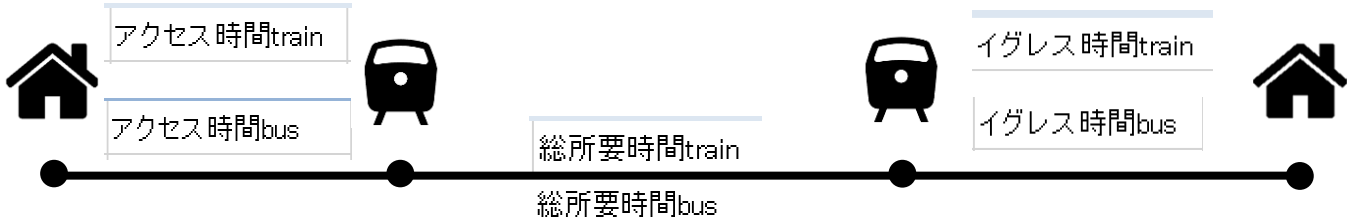
Travel Purpose

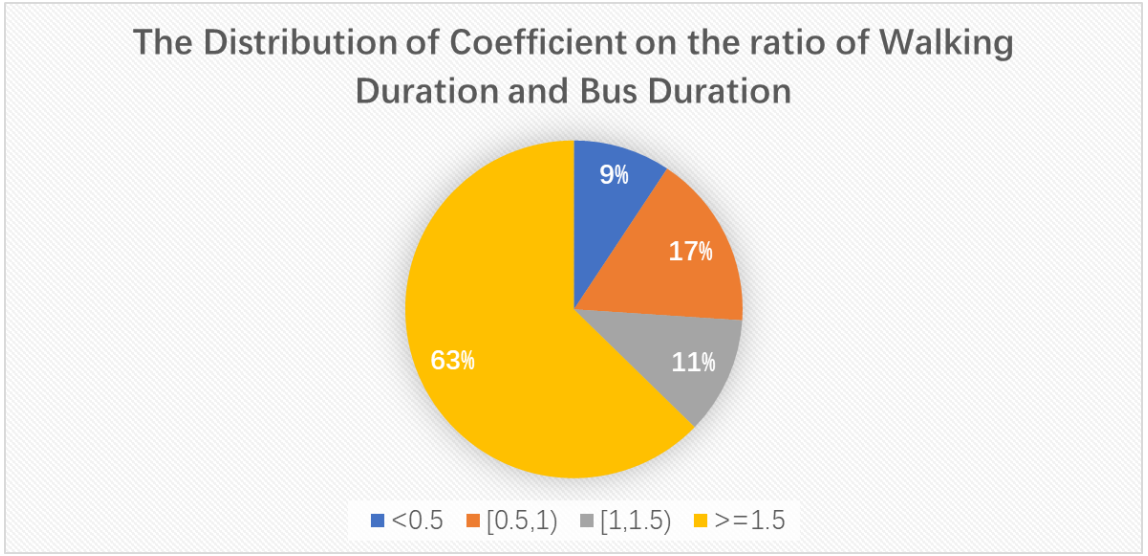


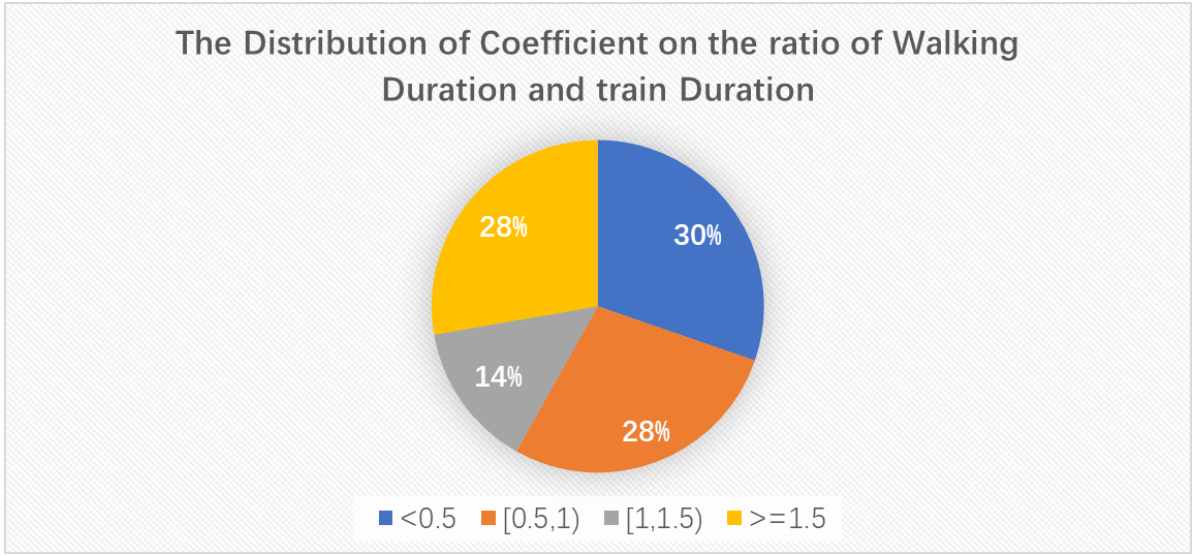


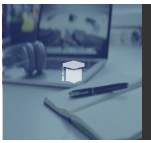
Basic aggregation

$$\alpha = \frac{walking\ duration}{bus\ duration\ or\ train\ duration}$$









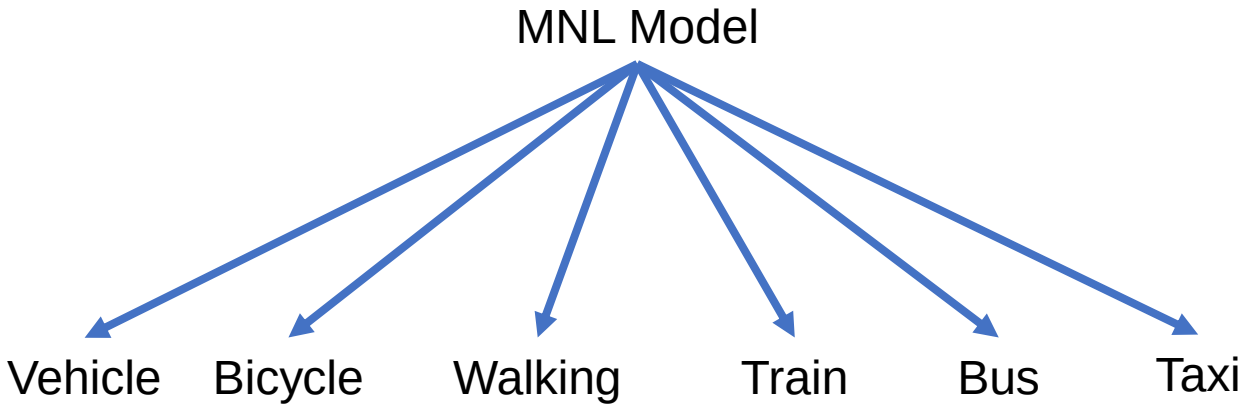
Basic aggregation

$$\alpha = \frac{walking\ duration}{bus\ duration\ or\ train\ duration}$$

What does this mean?

- The data rule of priority level, if there has walking or train in one trip, the travel mode in this trip is train.
- We want to keep the walking information in mix mode trip.
- Walking time is also important in train trip and bus trip.
- Bigger α means the longer walking duration than bus/train duration in this trip.

Model



Utility function:

*V_train= d1*time_train + f1*fare_train + t1*ratio_train + c1*transfer + b1*

*V_bus= d2*time_bus + f1*fare_bus + t1*ratio_bus + b2*

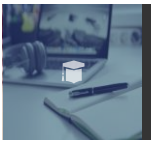
*V_car= d3*time_car + a2*age + p2*purpose + b3*

*V_bike= d4*time_bike + b4*

*V_walk= d5*time_work + p4*purpose*

Estimation Results

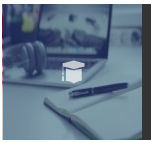
Parameters		Estimate	t-value
Constant	Train	1.2337494	4.177414
	Bus	-0.796119	-1.98426
	Car	-0.638229	-1.98745
	Bike	-0.873983	-3.96771
Time	Train	-0.049678	-3.80659
	Bus	0.0721624	2.445668
	Car	-0.037198	-4.53481
	Bike	-0.042646	-8.72428
	Walk	-0.071268	-6.60252
Cost		0.0004636	**1.068806**
Ratio		-0.373369	-6.26235
Transfer times	Train	-0.879378	-5.787
Age	Car	2.284371	9.703306
Travel purpose	Car	0.3741101	1.624151
	Walk	1.5019587	4.553961
Number of samples		1233	
LL0		-1702.990	
LLC		-1012.41	
ρ^2(before)		0.406	
ρ^2(after)		0.396	



Policy insights

- New transport modes are needed in order to instead of walking
- Adding new bus routes
- Setting bike-sharing stations
- Promoting shared mobility

Of course, “point policy”!



Results

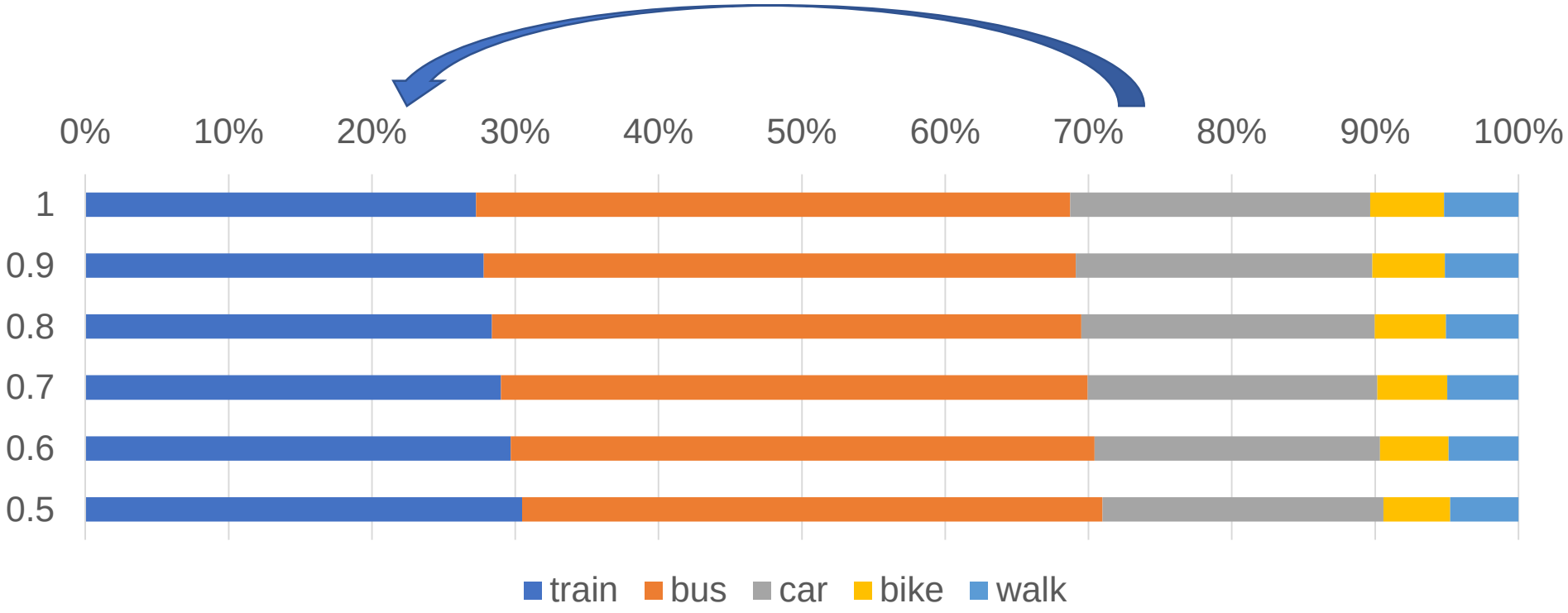
We assume that the walking time will decrease through policy implementation.

$$new\ walking\ time = original\ walking\ time \times \mu$$

$\boldsymbol{\mu}$=0.8

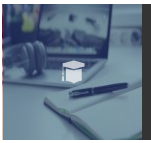
	train	bus	car	bike	walk
Average(before)	0.272571	0.414738	0.209274	0.051486	0.051931
Average(after)	0.283728	0.411331	0.204632	0.049805	0.050503
Difference	0.011157	-0.00341	-0.00464	-0.00168	-0.00143

Results



Transport mode	Car	Sharing bus	Normal bus	Train	Metro
Carbon emission (g/km)	45	8	19	5	3

9 times!



Results

Transport mode	Car	Sharing bus	Normal bus	Train	Metro
Carbon emission (g/km)	45	8	19	5	3

9 times!

31 people's trip:
The total distance of car using : 9509 km

Only decrease 1% of car using → decrease 3.8kg carbon emission

↓

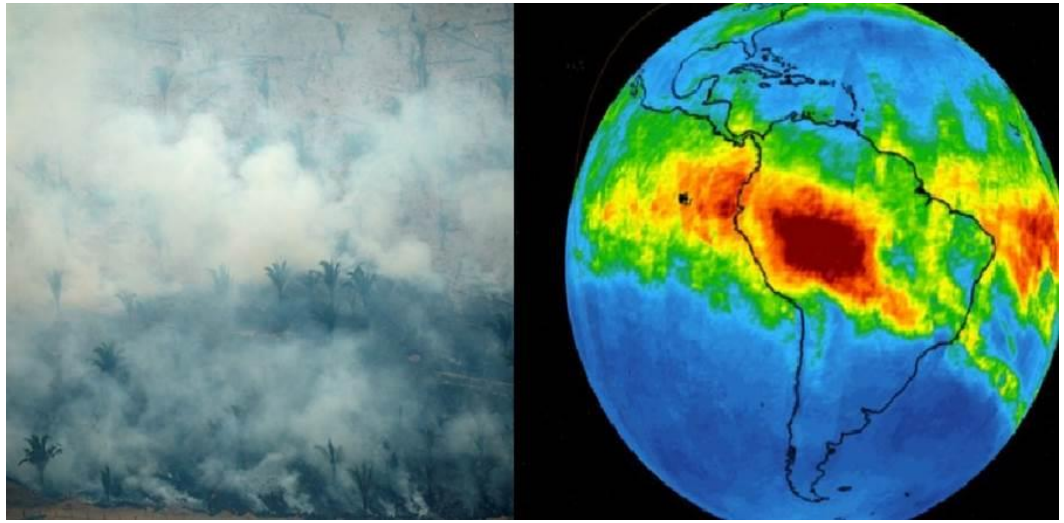
1 tree absorb 2.28 months

(Public Transport Users Association，2014)

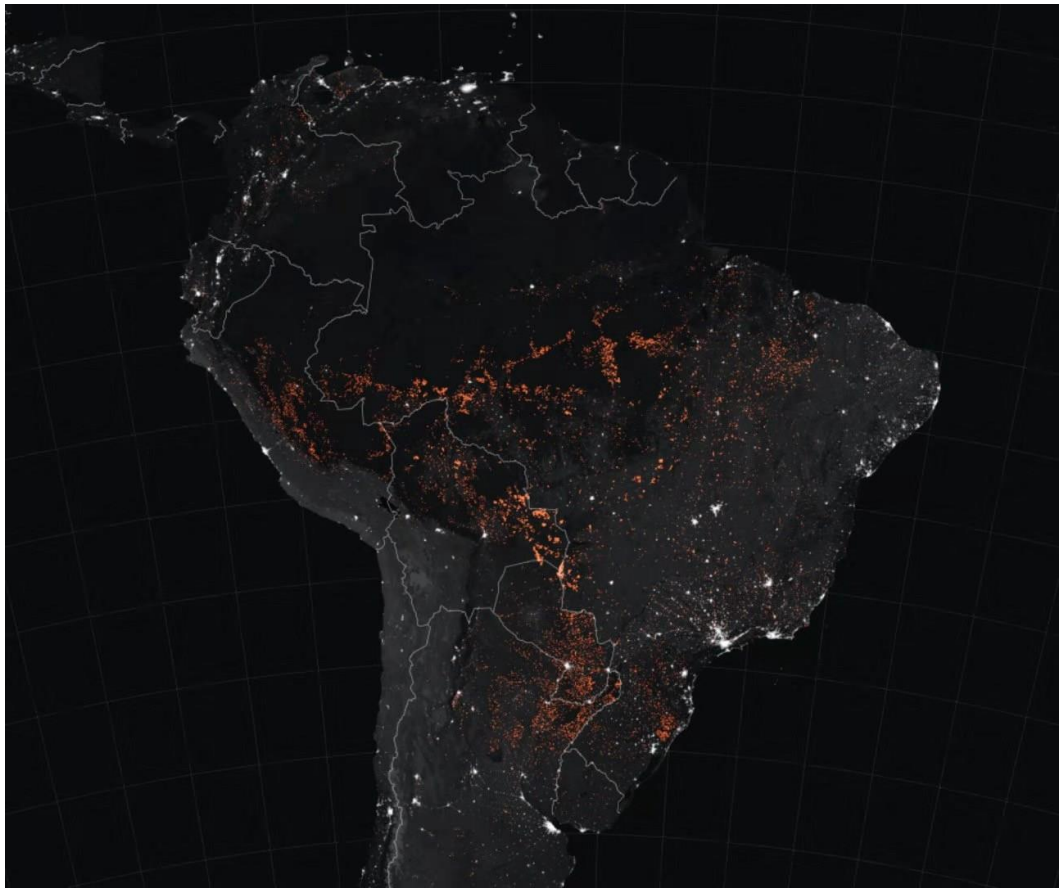
Policy insights

Inspiration

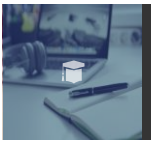
Amazon Fire Activity in 2019



Source from: https://www.chinatimes.com/cn/realtimenews/20190825002396-260408?chdtv



Source from: https://eoimages.gsfc.nasa.gov/images/imagerecords/145000/145498/southamerica_tamo_2019234_lrg.png



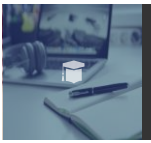
Policy insights

- Encourage sharing mode!
- Let’s plant trees together!
- Let’s plant trees together with LINE friends!

For example:

Every one time sharing mode: 100 point

10000 point→1tree



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Thanks
Q & A