

# Mainstreaming walking as low carbon urban mobility

**to improve air quality in the cities**

**Feat.: Case study of Kitakyushu, Japan**

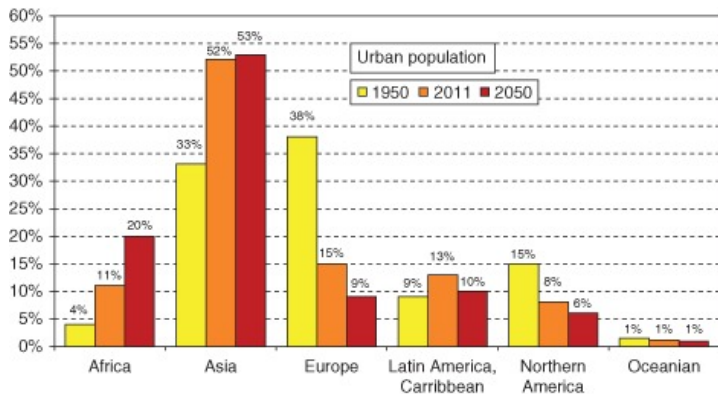
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*2018 Clean Air International Forum*

Gyeonggi Province, Republic of Korea, 19-20 October 2018

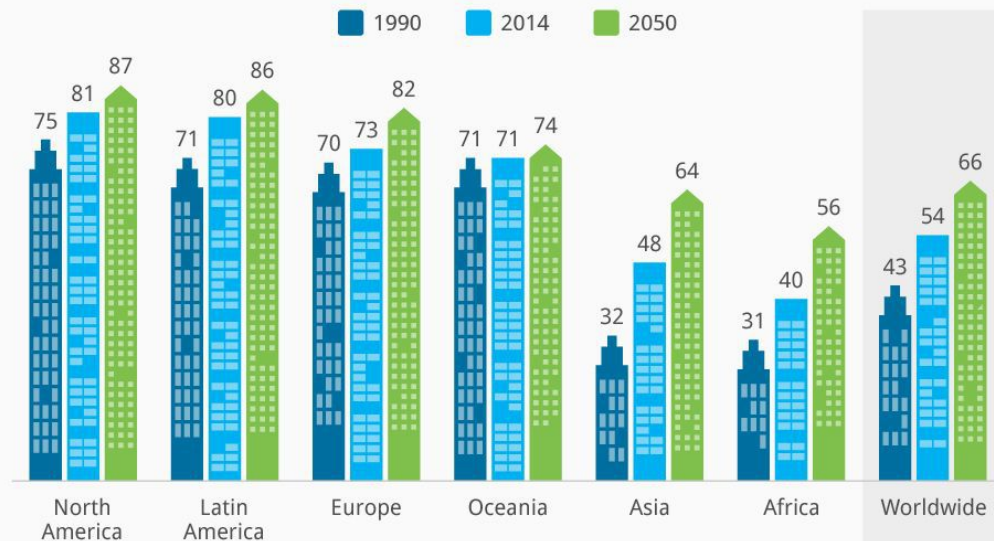




(Source: United Nations, 2012)

## 54% of the World's Population Now Lives in Cities

% of the population living in urban areas



Source: United Nations

Mashable statista

## MORE THAN HALF LIVES IN THE ASIAN CITIES

The Asian Development Bank estimates that the population of Asian cities are increasing by 40 million annually (ADB, 2009).

More than **80%** of people living in urban areas that monitor air pollution are exposed to air quality levels that exceed WHO limits (CAA, 2015).

Asia region has the highest number of air pollution-related deaths globally.

**2,2 m** deaths from air pollution in Asia (WHO, 2016), 1 out of 8 deaths globally.

Pollutants	Transport Share (%)	Urban Share (%)
NOx	55	26
CO2	35	43
Particulates	65	20
HC/VOC	40	76
CO	85	73
SO2	10	28
Pb	50	54

(Source: Zamaras & Zierock, 1992)

## Most of the Asian cities experience:

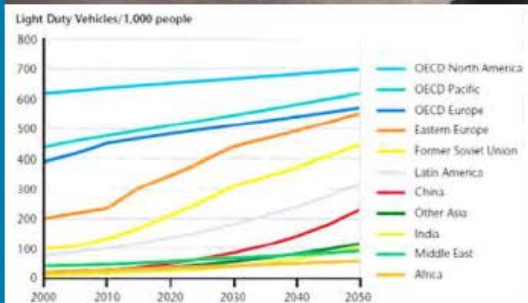
- **TRAFFIC JAM** → inadequate of transport infrastructure and public transport services
- **ENVIRONMENTAL PROBLEMS IN AIR POLLUTION** → the vehicle emissions and bad quality of fuel
- **UNCONTROLLED GROWTH OF PRIVATE VEHICLES** → economy growth and lack of investment in public transport and law enforcement

Transport accounts for **26 % of global CO2 emissions** and is still growing (Chapman, 2007).

Today, world citizens move **23 billion km** in total; by 2050 that figure grows to 105 billion (Schafer & Victor, 2010).



In Thailand, Malaysia, Indonesia and India motorcycles account for **70% of the total vehicle fleets**, and are responsible for a large and growing proportion of total air pollution (Weaver & Chang, 1994).

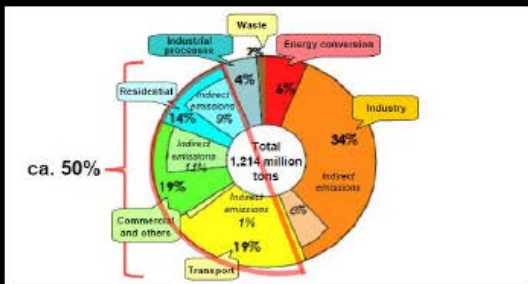


Fuel combustion in transportation is a major cause of carbon dioxide emission.

Incomplete combustion in car engines generates gases which are harmful to human health and causes of global warming.

The number private cars has increased in Asia and is partly responsible for the increasing amount of carbon dioxide (Schipper, 2013).

## URBAN CARBON EMISSION



Approximately 50% of the total CO<sup>2</sup> emissions are from the cities which one third is from the transportation sector single-handedly.

Ministry of Land, Infrastructure, Transport and Tourism Japan

## High Carbon Urban Mobility

- **Extensive carbon emission**
  - Major trigger of climate change
- **Air pollution and traffics**
  - Unsafe for citizen (pedestrian)
- **Fossil-based energy exploitation**
  - Over consumption
- **Urban sprawling**
  - MVP = Motorized Vehicular People



## Low Carbon Urban Mobility

- **Carbon emission reduction**
  - Improve air quality in the cities
- **Clean air and shared street**
  - Walkable and liveable neighbourhood
- **Energy efficiency**
  - Sustainable use of non-renewable energy
- **Urban de-sprawling**
  - Compact city through Diversity, Density, and Design

# LOW CARBON URBAN MOBILITY

Non-motorized transportation is alternative transportation without employing motor vehicles.

It is an economical and eco-friendly way of traveling and mostly causes no adverse affects on the environment.

It boosts conservation tourism and adds charm and fosters good impressions of a city.

## Cycling



## Walking

Door-to-door;

High spatial penetration;

No waiting times;

Favourable environmental performance;

Cheap transport modes;

Essential in multimodal transport chains;

Healthy activities

**(Rietveld, 2001).**





IMPROVING  
**WALKING** condition and environment

could

AVOID **TRAFFIC CONGESTION**  
CONSERVE **NATURE**  
IMPROVE **PUBLIC HEALTH & LIVING QUALITY**

(Blanco et al., 2009)

## Sustainable Mobility Paradigm

- **Reducing the need to travel**
  - substitution
- **Transport policy measures**
  - modal shift
- **Land use planning measures**
  - distance reduction
- **Technological innovation**
  - efficiency increase

Banister, 2011

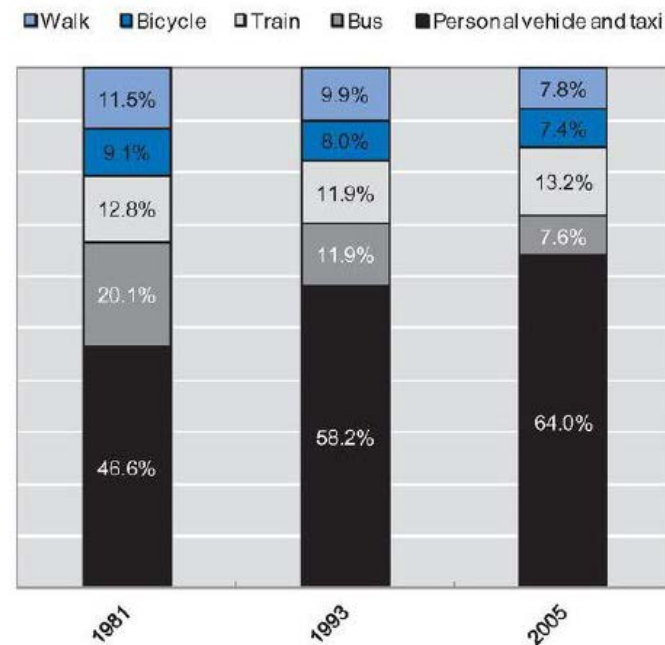
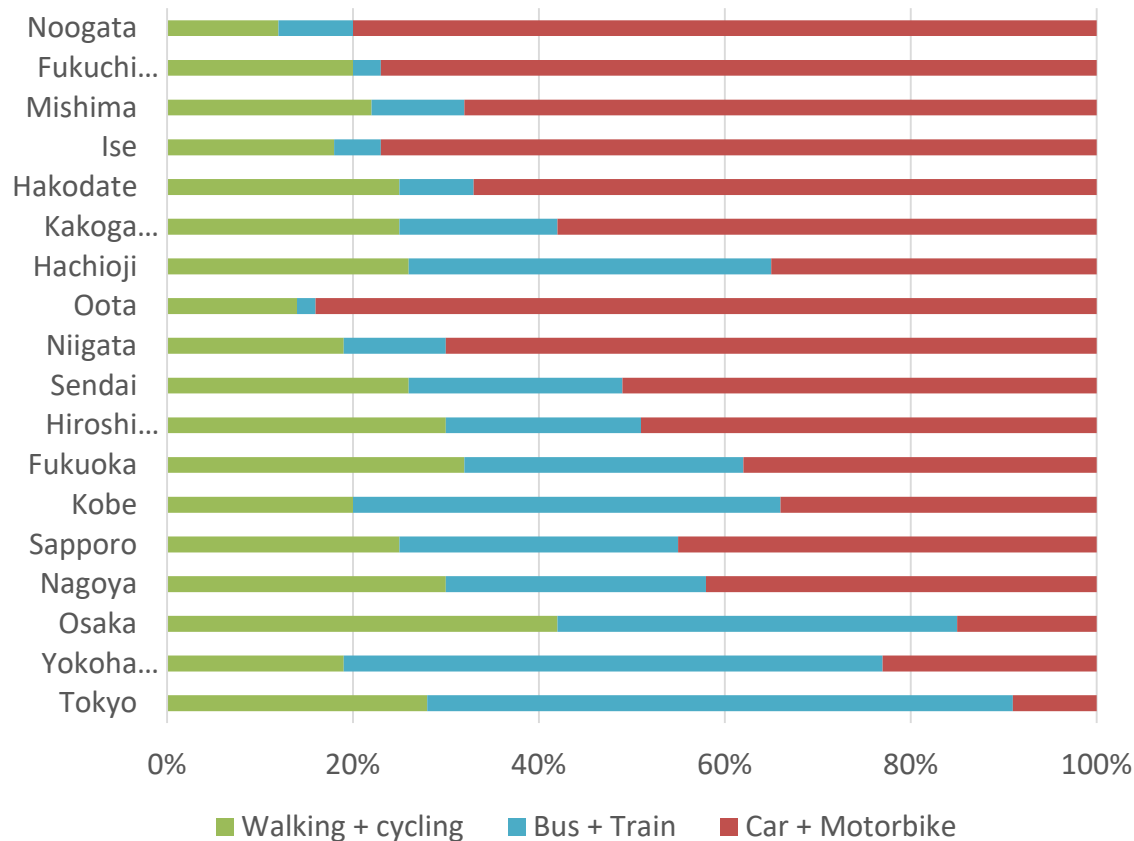


Traditional cities in Japan were generally planned in grid pattern and centralised public spaces are not common (Jinnai, 1995; Kurokawa, 1983).

Social activities would normally take place in micro-scale spaces like the alleyways, or in privately owned open spaces where people were protected from wheeled traffic.

**Contextually appropriate way to improve the quality of urban space is by improving the streets.**

### 2010's Transport Modes in SDG 11 Database (IGES, 2015)



Changes in modal share for commuting in Kitakyushu  
Source: OECD, 2013

**Current Reality**

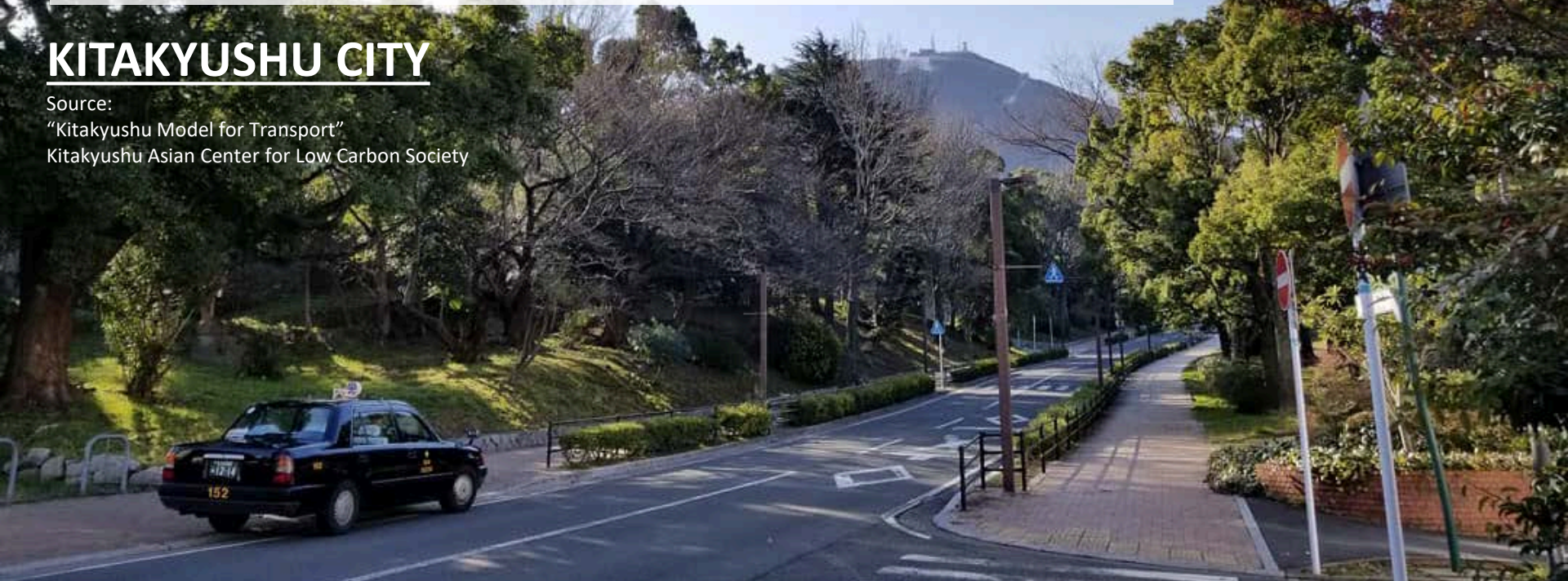
The expansion of the city's density inhabited district (DID district) had gone hand in hand with **the decline in public transport and corresponding motorisation**, which has contributed to **the increase of GHG emissions in the transport sector**.

## KITAKYUSHU CITY

Source:

“Kitakyushu Model for Transport”

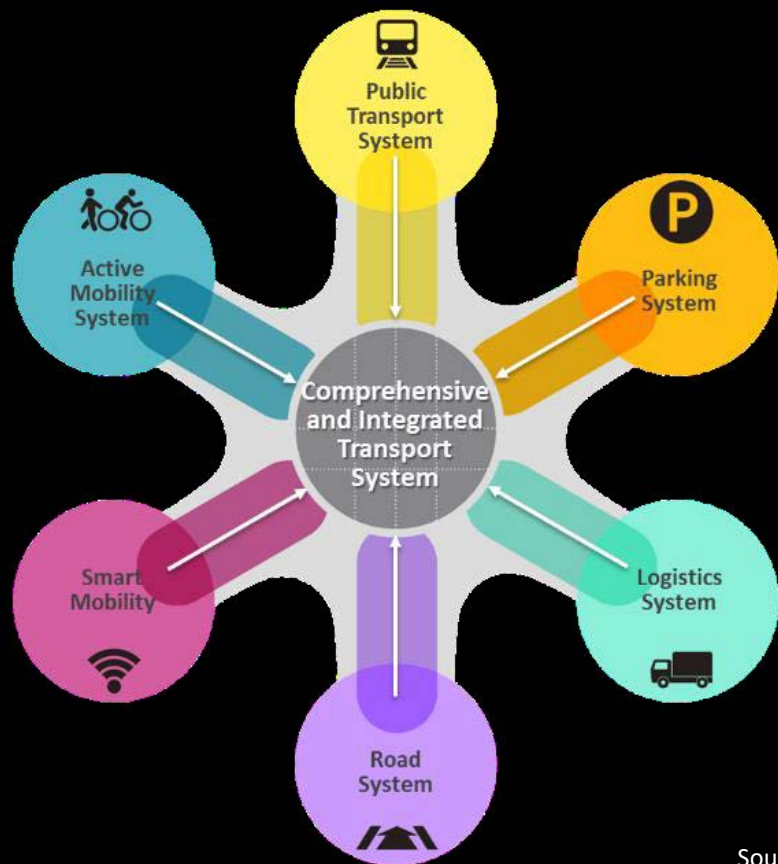
Kitakyushu Asian Center for Low Carbon Society



From 2007 to the present, Kitakyushu City has been working to improve the quality of public transport services

In 2008, **the Kitakyushu Environmental Capital Comprehensive Transport Strategy** was developed, which integrated transport strategy and economic aspects such as downtown revitalisation, social aspects such as an aging population and barrier-free support, and finally environmental issues such as global warming.

In this way **a holistic policy strategy** is being developed.



Source:  
 “Kitakyushu Model for Transport”  
 Kitakyushu Asian Center for Low Carbon Society

SUPPLY

- Public Transport System
- Active Mobility System**
- Smart Mobility System
- Road Network System
- Parking System**
- Logistics System

DEMAND

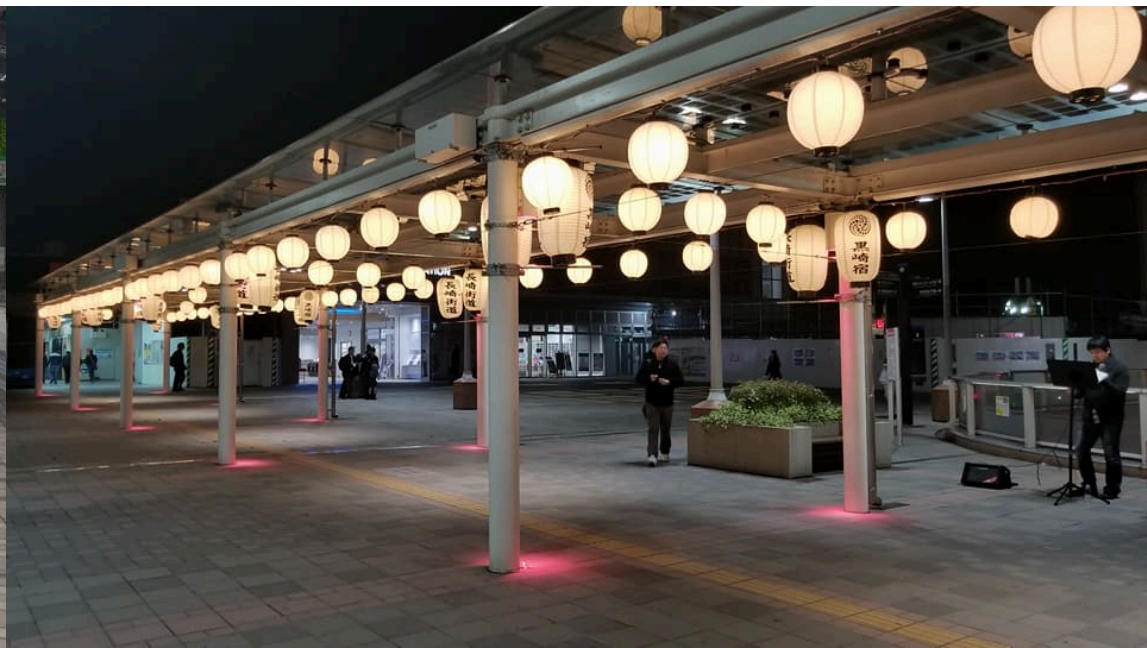
- Reducing Traffic Demand
- Shifting Transport Mode**
- Improving Transport Efficiency

PLUS

**Transit Oriented Development**

## Active Mobility System

A good pedestrian network would reduce the needs of any mechanised vehicles for any short distance travel and could also increase the accessibility and comfortability to use public transport. Both will contribute the success of green urban transport usage in a city.



### 4.3-1: Initiatives of Kitakyushu City in Establishing Active Mobility Systems

#### 1) 8th Kitakyushu Traffic Safety Plan (2011-2015)

- Measures relating to active mobility system implementation are as follows:

a) To help improve safety for children and the elderly: the formation of a barrier-free road traffic environment and the promotion of traffic safety measures

b) Pedestrian and bicycle safety: Under the concept of human priority ensuring pedestrian space on school routes and community roads, regular maintenance of the sidewalk on city roads, securing traveling space for bicycles, and traffic safety education.



#### 2) Barrier-free Town Development (1998 -)

- In the city centre, sub-centre districts, main station surrounding areas etc.: Promote barrier-free urban development.





#### 4.3-2: Town Mobile Network (TMN) Kitakyushu Initiatives

In Kitakyushu, to promote 'rent-a-bicycle' and the 'mono-ride' concepts, a voluntary institution was founded in 2002. In 2003, the NPO organisation 'Town Mobile Network Kitakyushu' was registered.

## Parking System



### *On-street Parking*

- should only be provided when there are shortage of off-street parking facilities and charged
- it has impacts on pedestrian and other roadside activities.
- should there be spaces, better to widen the pedestrian pavements and/or cycle lanes.

### *Off-street Parking*

- should be the major form of parking system in an urban environment
- different land uses will have different level of parking provisions
- lowered near a rail or metro stations so as to encourage the public transport usage.

## Shifting Transport Mode

Promote environmental awareness of the public so as to encourage walking and cycling, not only for mobility reasons but also for health conscious;

Improving the walking and cycling conditions to make it safer and better adaption to the weather changes;

Setting the design of signalised junction to consider the speed of cyclists and elderly for crossing roads.

Fare incentive for bicycle park-n-ride in public transport usage.



## Transit Oriented Development

A typical TOD has a rail or bus station at its centre, surrounded by relatively high-density development, with progressively lower-density spreading outwards 400 metres to 800 metres, which represents reasonable walking distance.

A well planned TOD would turn a station from a transport hub into an activity hub so that people could easily access the development by means of convenient public transport, in particular, railways or metros, for longer distance and **by walking/cycling, if walkways and cycle network are provided.**

According to OECD green growth study/ Green growth in Kitakyushu city (2013), Kitakyushu monorail, which started its service in 1985, is a successful example of TOD which brought urban development along rail line connecting from the Kokura station to the south part of the city.

# **DO PEOPLE WALK?**



**Type 1** is the pedestrian way which has no separation with the road for vehicles. The pedestrians share the same space with the other transport modes.

**Type 2** is the pedestrian way which has marks in a form of colored line or surface to indicate the walkway.

**Type 3** is the pedestrian area which is elevated at around 10 cm or higher from the road surface and covered mostly by pavement.

**Type 4** is the pedestrian way which is already well-defined physically like Type 3. This type could be referred as the advancement of Type 3 in regard to its width since it has wider width.

**Type 5** is similar with Type 4. In Type 5 we could already find greeneries along the pedestrian way.

**Type 6** is the modification of Type 4 or Type 5 of which includes the cycling way/track.



Pedestrian Ways in Japan @FritzNuzir - #pejalankota >100 types



## Pedestrian Profile

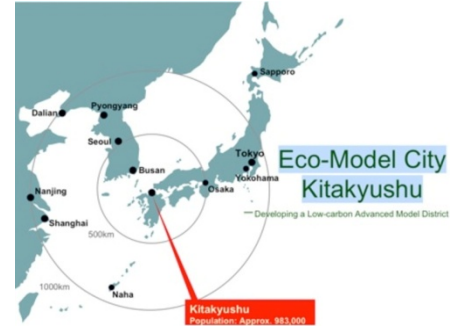
- age
- financial income
- physical condition
- Gender
- mobility choice
- employment and education
- Background
- social cultural capital
- pedestrian type
- public transportation usage

## Pedestrian Activity

- walking-related purposes
- social interaction
- walking intensity
- walking habits
- transport modes
- Interaction

## Pedestrian Environment

- spatial planning
- walk-ability
- neighborhood livability
- traffic safety
- pedestrian facilities (hard elements)
- pedestrian facilities (soft elements)
- environmental quality



Survey on respondents from Yahatanishi **Kitakyushu City** in 2016

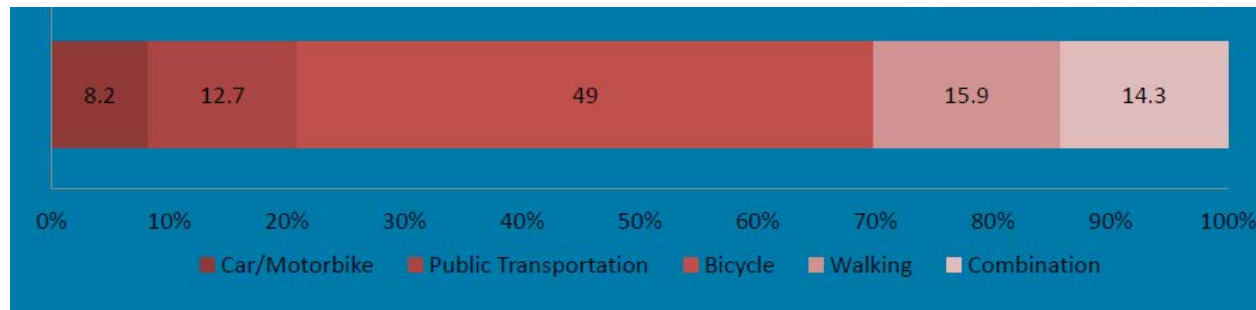
**PEDESTRIAN PL.AC.E**



Redefining Place for Walking: a Literature Review and Key-elements Conception (Nuzir & Dewancker, 2016)

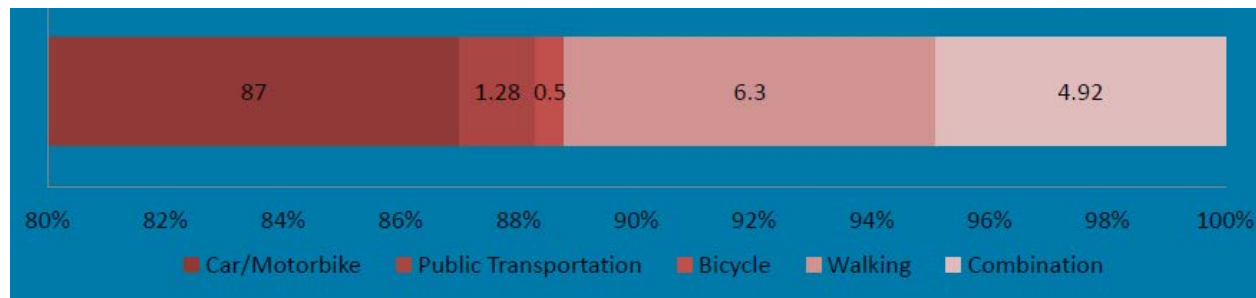
## Profile 1: Students

- bicycle as main mobility
- public transport occasionally
- studying in Kitakyushu, not familiar with environmental issues
- Japanese, lived in apartment in Kitakyushu, for <1 month
- single male <21 years old



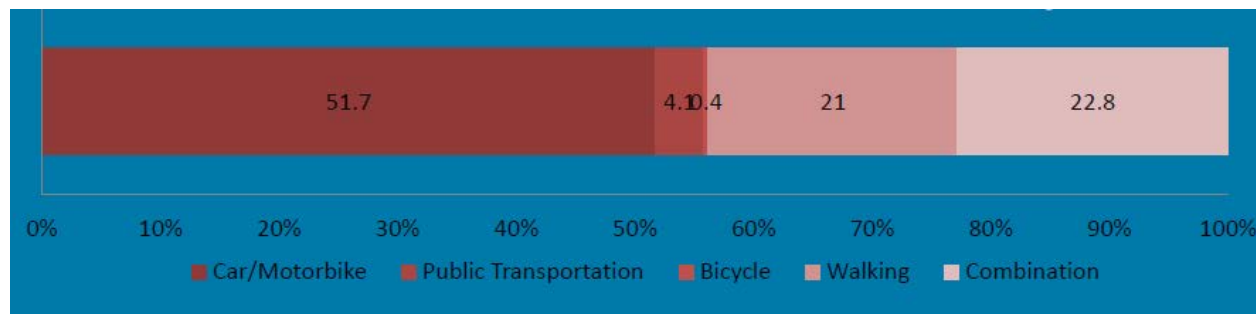
## Profile 2: Families

- car as main mobility
- public transport occasionally
- housewives, not familiar with environmental issues
- Japanese, lived in detached houses in Kitakyushu, for 2-<5 years, originally from inside Fukuoka-ken
- married female with >2 children, 21-40 years old



## Profile 3: Commuters

- car as main mobility
- public transport occasionally
- working or studying in Kitakyushu, not familiar with environmental issues
- Japanese, lived in detached houses in Kitakyushu, for >5 years
- male





### Activity 1: Students

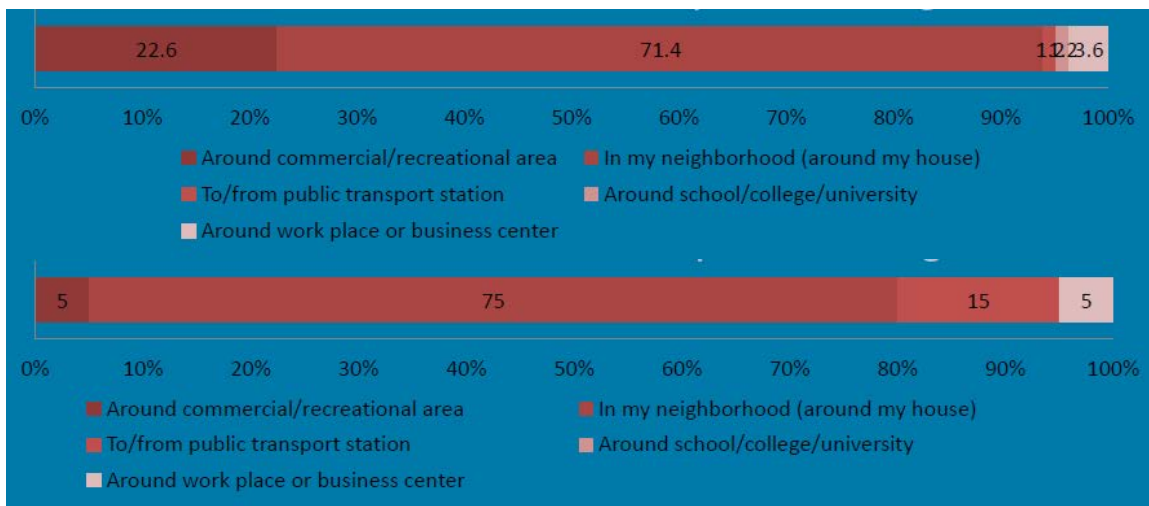
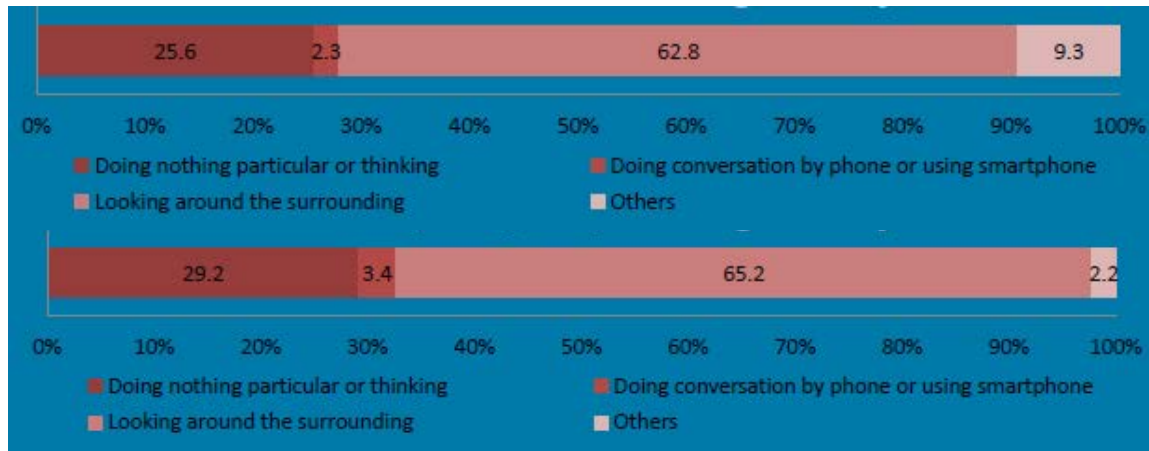
- following the sign when crossing
- reducing travel cost by walking
- talking with walk-mate

### Activity 2: Families

- walking in neighborhood, looking around when walking alone, following the sign when crossing
- knowing several routes and take them alternately
- walking to go to daily shops or pick up children
- combine walking with car
- adjusting walking position

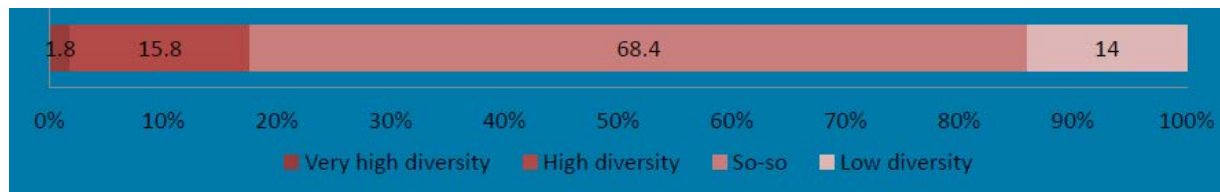
### Activity 3: Commuters

- walking in neighborhood, looking around when walking alone, following the sign when crossing
- walking 30 mins - 1 hour daily
- walking to visit/recreation/exercise, not to reduce travel cost
- combine walking with public transport
- adjusting walking position



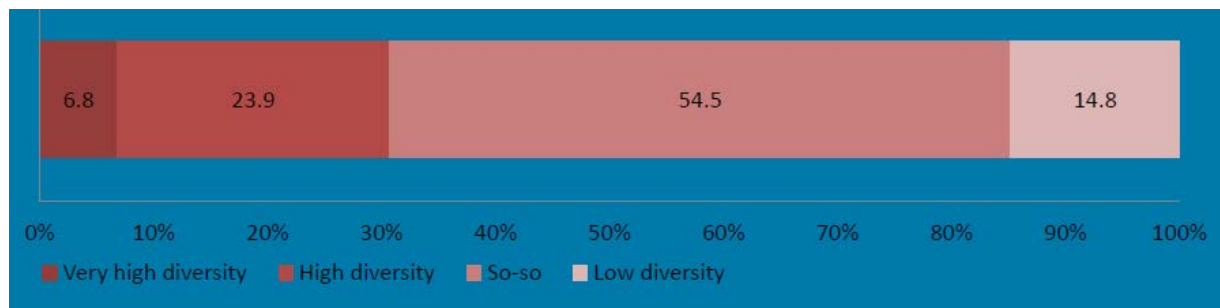
### Environment 1: Students

- low appreciation toward: pedestrian signage; traffic safety; noise and density; accessibility for disabled and weather; aesthetic; land-use
- high appreciation toward: route network



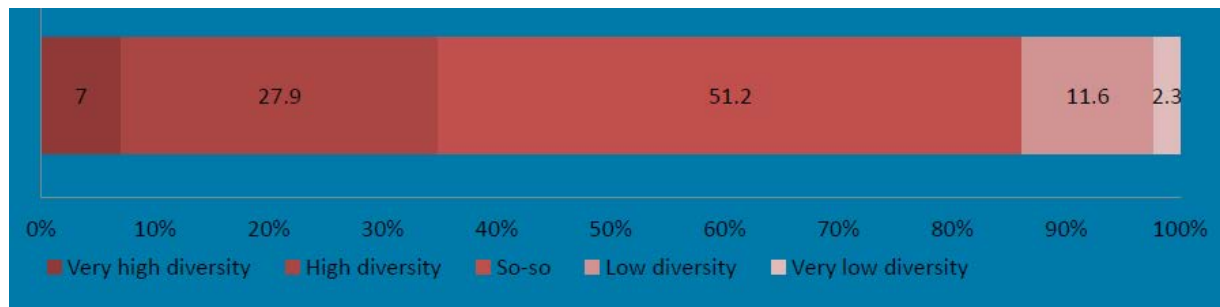
### Environment 2: Families

- low appreciation toward: pavement; traffic safety; security from crime and density; weather in winter; attractiveness of visual POI and aesthetic; land-use and distance

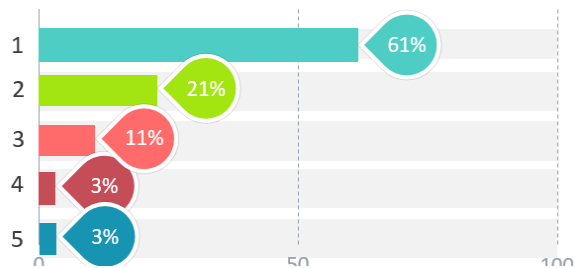


### Environment 3: Commuters

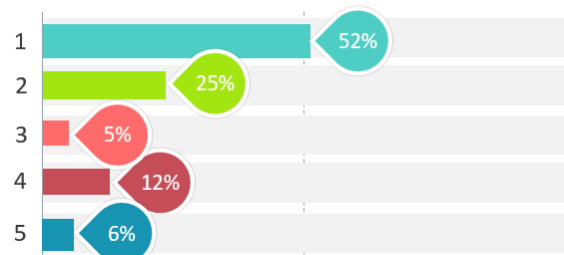
- low appreciation toward: security from crime and density; walking comfort, accessibility for disabled, weather in winter; cleanliness and aesthetic; land-use and distance
- high appreciation toward: pavement; attractiveness toward visual POI; access to public transport



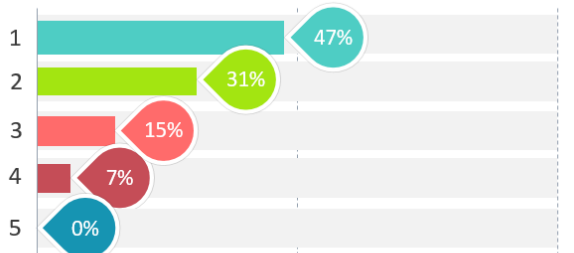
## Comparison with case study of Bandarlampung City, INDONESIA



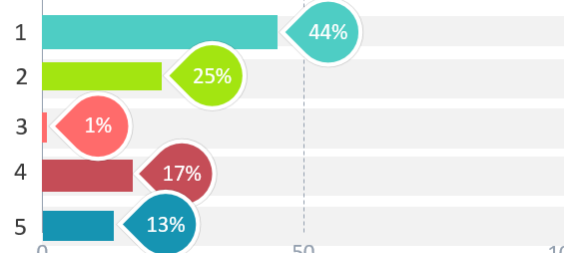
To work place



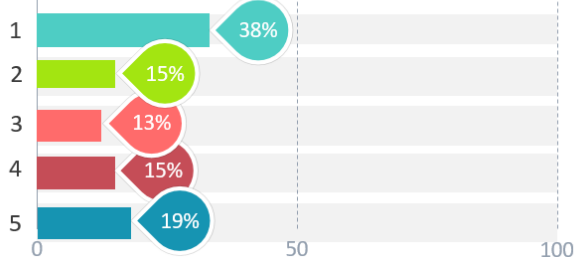
To public facility



To school

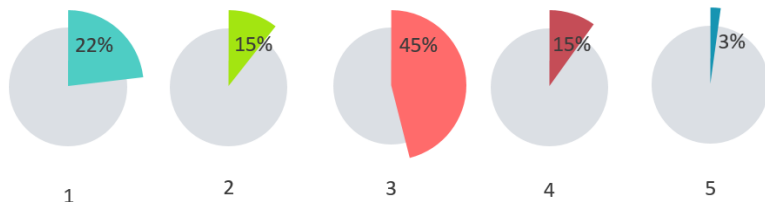


To recreation



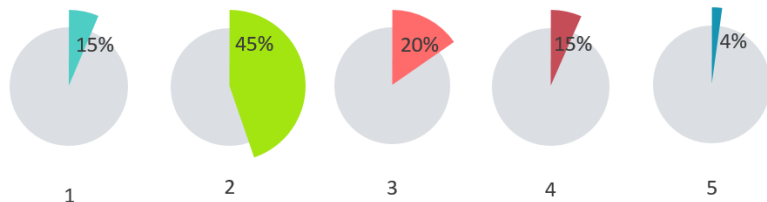
To daily market

- 1. Car or motorcycle
- 2. Public transportation
- 3. Cycling
- 4. Walking
- 5. Combination 1-4



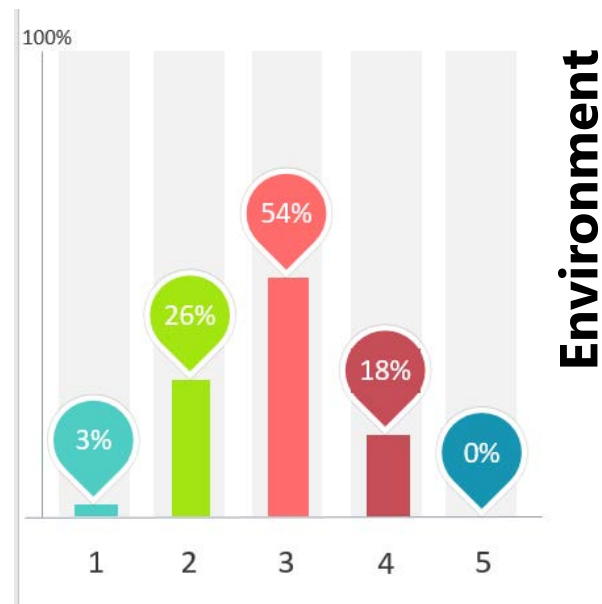
**Activity**

1. Doing nothing particular or thinking
2. Doing conversation by phone or using smartphone
3. Looking down at the pedestrian way
4. Looking around the surrounding
5. Others



**Activity**

1. Around commercial/recreational area
2. In my neighbourhood (around my house)
3. To/from public transport station
4. Around school/campus
5. Around work place



**Environment**

1. Very high diversity
2. High diversity
3. So-so
4. Low diversity
5. Very low diversity



Source:  
Shutterstock.com (700132921)

## Challenges

- Car is still the main urban mobility
- **WALKABLE (CLEAN AIR) neighbourhood is important**
- Land-use diversity is needed



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**감사합니다**  
**Thank you!**