



Smart Eco-path Finder for Mobile GIS Users

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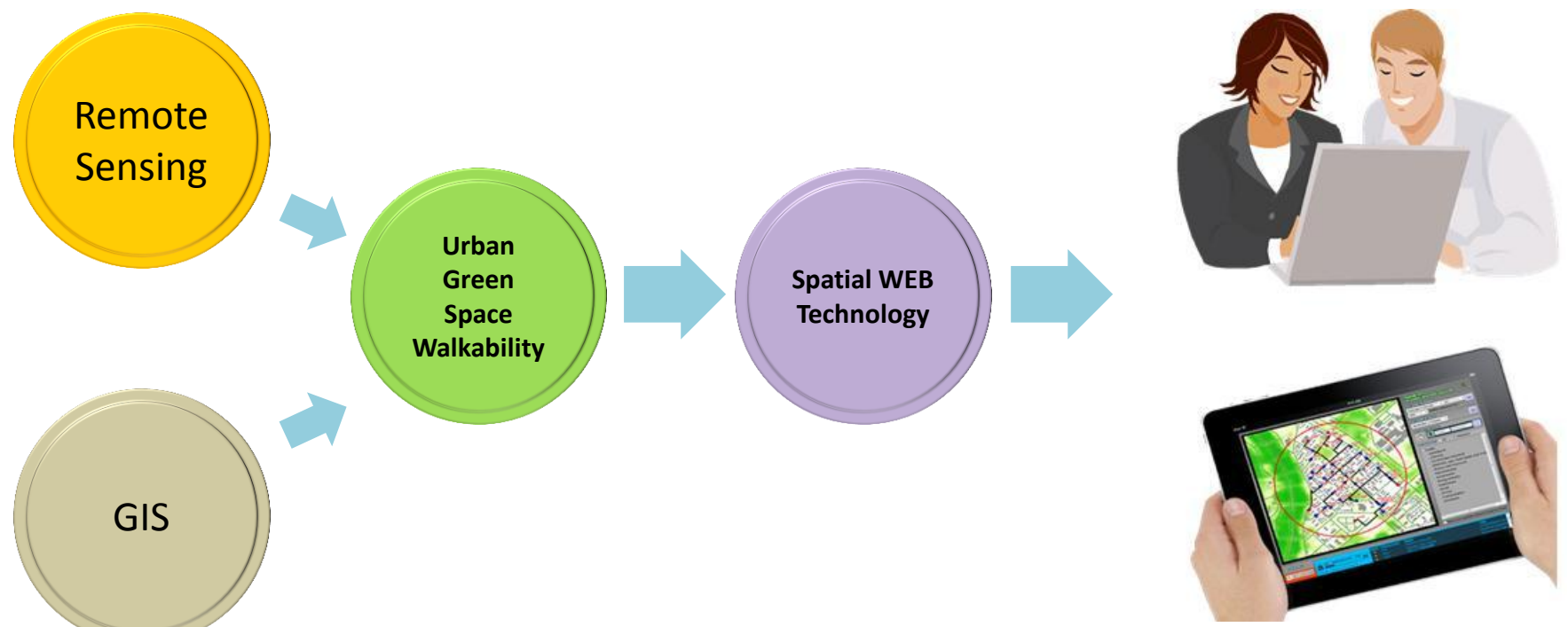
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Objective



Integrate Remote Sensing and GIS
Build Urban Green Space Walkability Model
Deploy Spatial Web Technology



Local residents decision making
Find eco-friendly living place
Find shortest or greenest paths



Urban Green Space

Benefits

Increase Social Interaction and Cohesion

Improve Public Mental Health

Save Country Socioeconomic

Reduce cooling and heating demands

Reduce Urban Heat Island impact

Improve air quality ...



Project Area



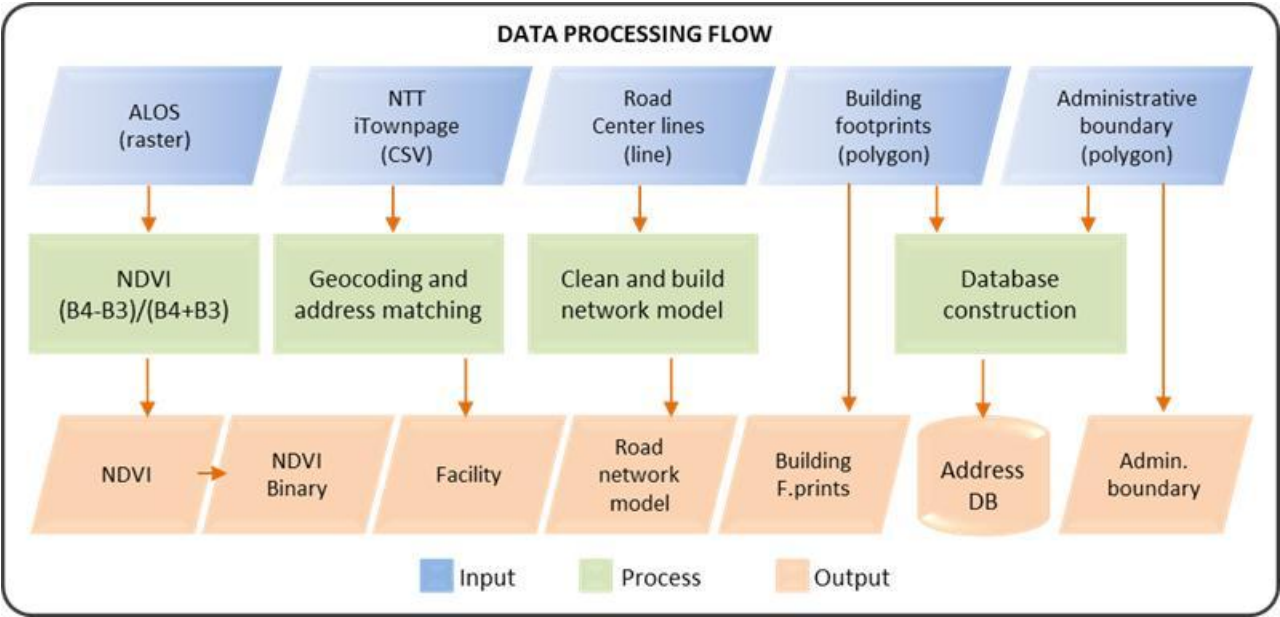
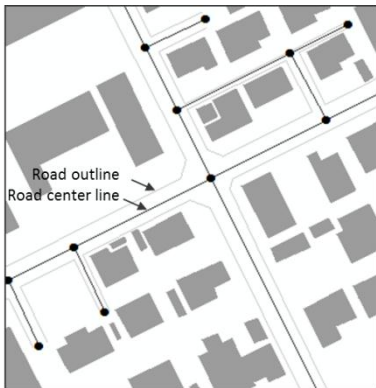
Tsukuba City (45 minutes from Tokyo,
Tsukuba Express Train)
 Research and academic purposes
 Also known as Science City
 Home of: *University of Tsukuba*
JAXA, NIES, AIST,
 Area: 284.07 km²
 Population: 207,394 (2008)



Urban Green Space Walkability Model

List of Data

- ALOS-AVNR2 (JAXA)
- Building Footprint
- Administrative Boundary
- Road Center Line
- NTT iTownpage



NDVI binary image: Greenness score calculation

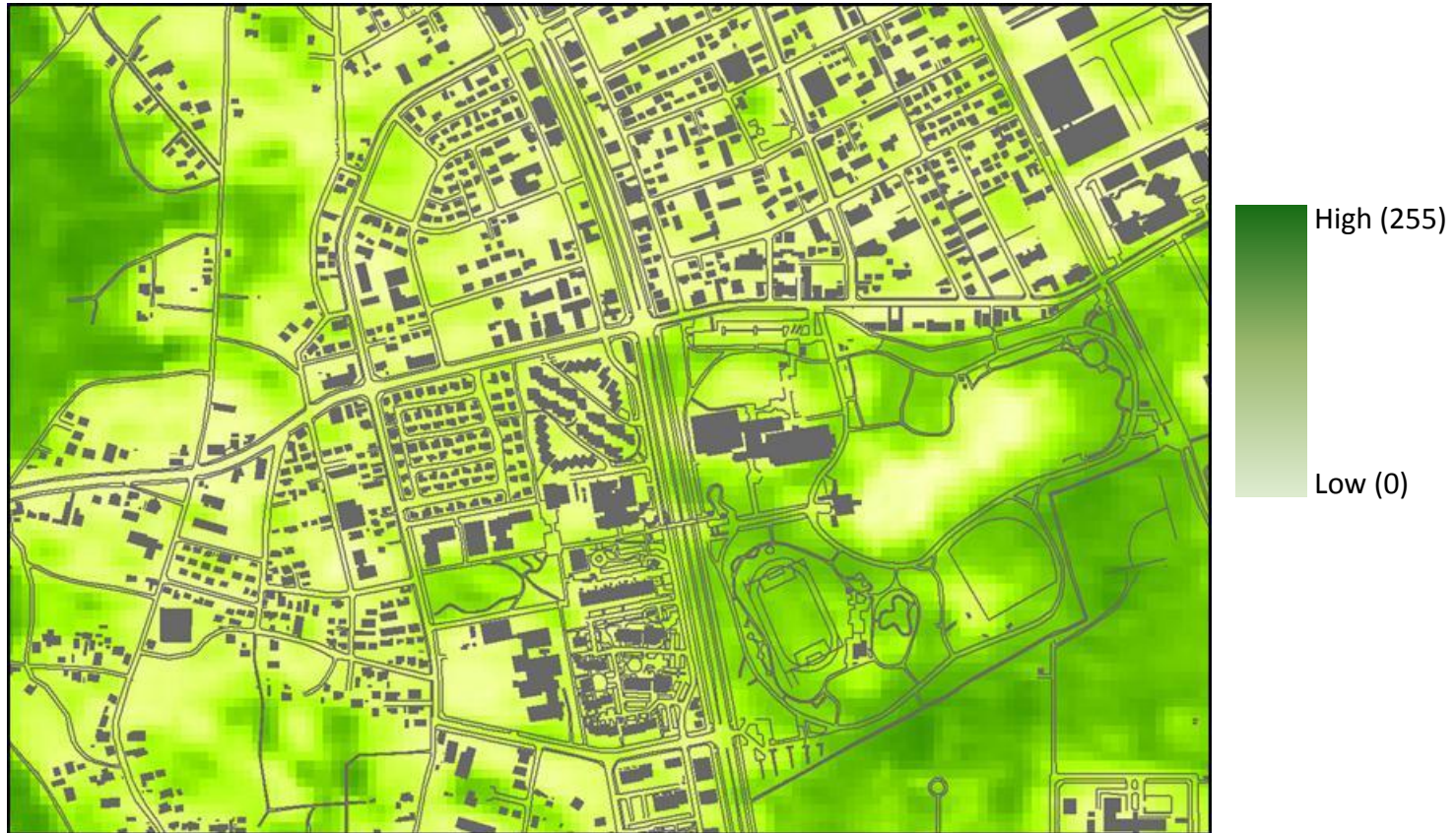
iTownpage: Allocation of facility point

Road center line: Find shortest and greenest path

Building Footprint + Admin. Boundary: Construct address database



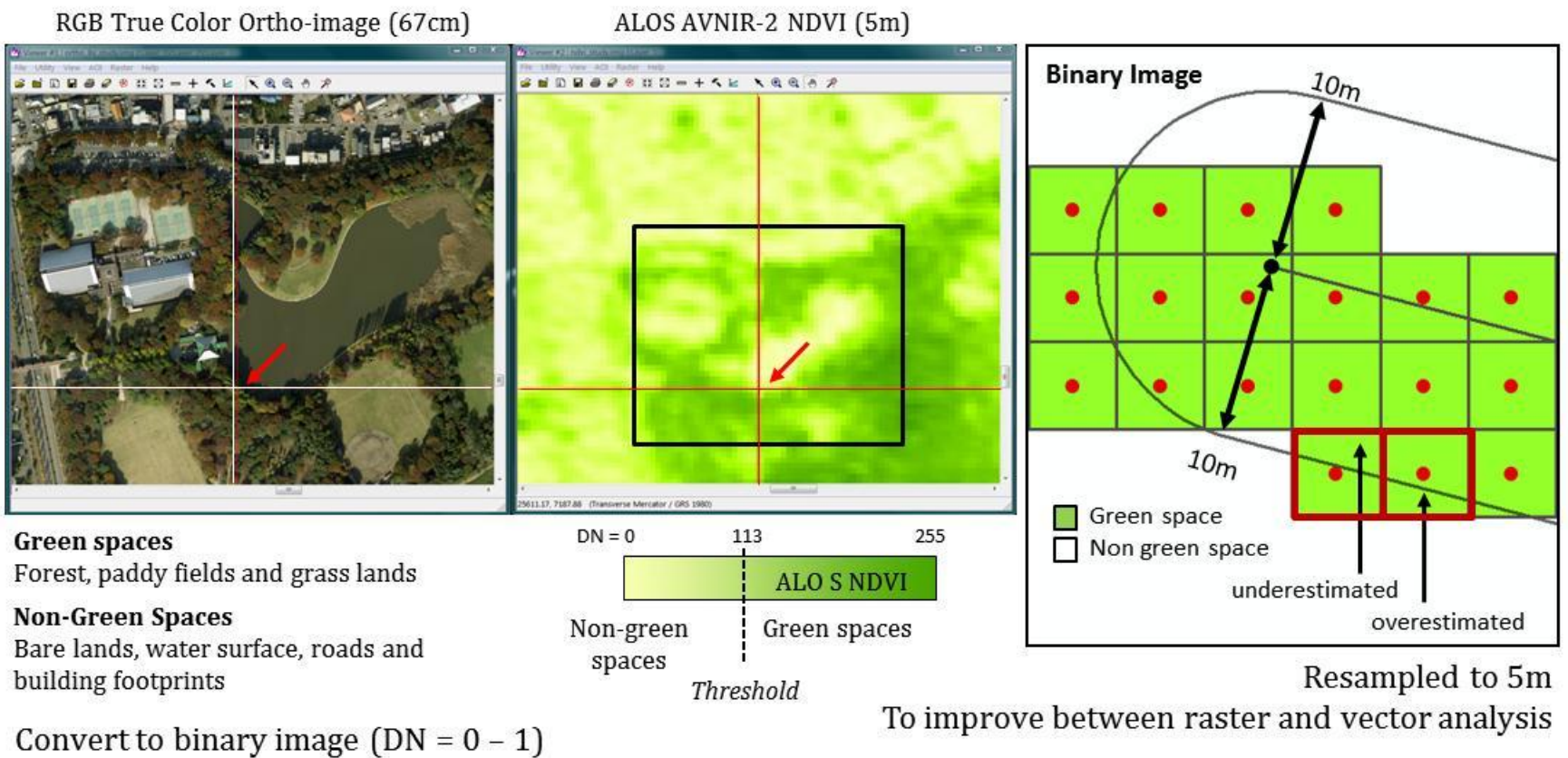
Urban Green Space Walkability Model



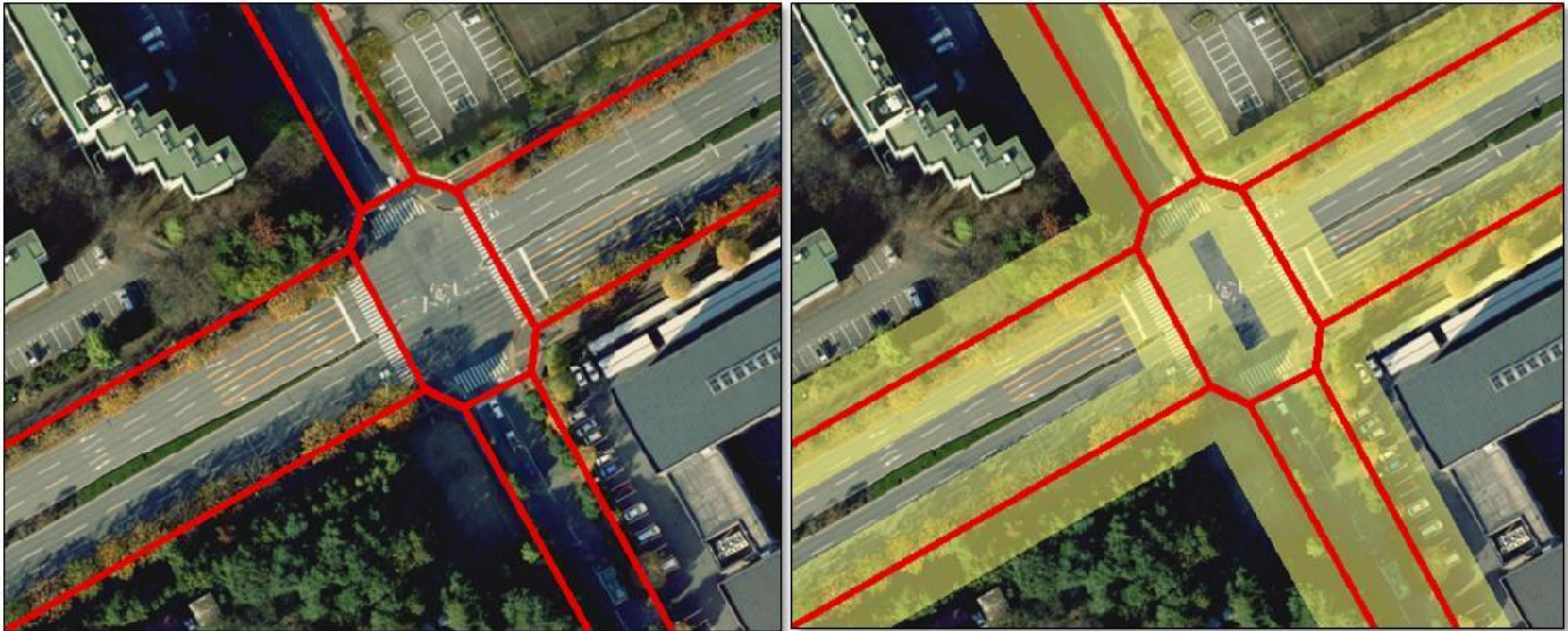
NDVI intensity image derived from ALOS data



Urban Green Space Walkability Model



Urban Green Space Walkability Model



Building a GIS Road Network Data Model



Urban Green Space Walkability

Building Footprint: *To construct address database*
Administrative Boundary: *To construct address database*

GET SCORE BY ADDRESS

Kasuga 3 Chome

10-16

Go

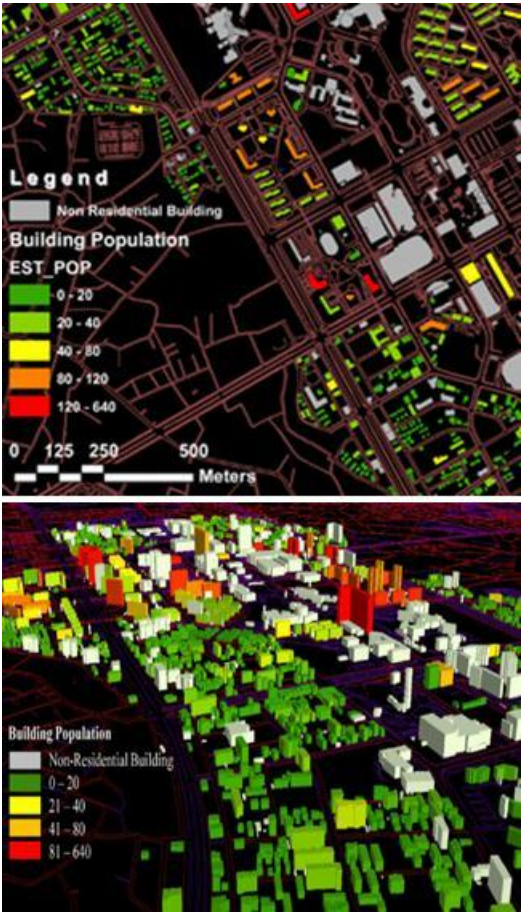
350

Buffer Distance (m)

Example:
Japanese addressing system (Block System)
Kasuga 3-10-16, Tsukuba, Ibaraki, Japan 305-0821

Western or other countries (Linear System)
701 Lee Street Suite 680, Des Plaines, IL, 60016
500 Dover Street, City Hall, Singapore

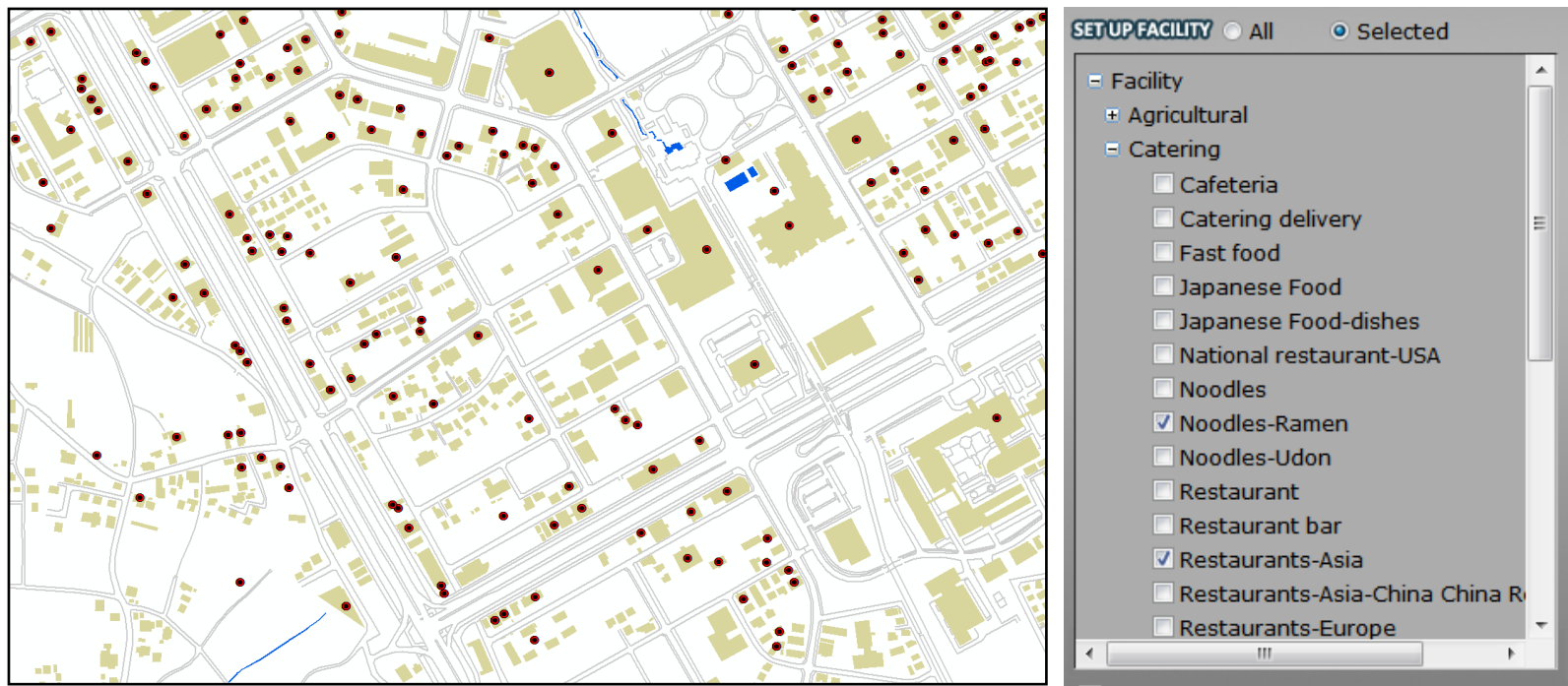
Building foot prints data are useful for building population estimation by integration with number of floors information or building height derived from LIDAR data.



Urban Green Space Walkability

NTT iTOWNPAGE (Nippon Telegraph & Telephone Corp.)

Internet TownPage which includes: Business name, address, category, sub-category, business contents, phone number, URL, etc., in CSV Comma Separated Value format



To find available and desire facility locations



Measurement Modes

Home Users: Get Score by Address or User Defined Point

Mobile GIS Users: Get Score by Walking Route (Smart Eco-path Finder)



Home Users



Mobile GIS Users

How to utilize urban green spaces with **GIST** (GIScience & Technology)?

How to **evaluate neighborhood environmental quality** with GIST?

How to find **shortest paths for shopping** with GIST?

How to find **greenest paths for walking** with GIST?



Measurement Modes

Get Score by Address (Local Residents)

1

GET SCORE BY ADDRESS

Sakura 3 Chome

10-1

Go

350

Buffer Distance (m)

2

☒ Fast food

☒ Japanese Food

☒ Japanese Food-dishes

☒ National restaurant-USA

☒ Noodles

☒ Noodles-Ramen

☐ Noodles-Udon

☒ Restaurant

RESULT

MIN

GREENNESS SCORE

MAX

32

Address: Sakura 3 Chome-10-1

Radius: 350 m

Greenness Score: 32

Total Facilities: 86

Qualified Distance Shops: 42

Greenness Score = (GA / CA) * 100
*Qualified Distance:
Network distance <= User defined radius
For local residence



Measurement Modes

Get Score by User Defined Point (Potential Home Buyers)

1

INTERACTIVE SCORE

  Single Greenest Go

2

☒ Fast food

☒ Japanese Food

☒ Japanese Food-dishes

☒ National restaurant-USA


☒ Noodles

☒ Noodles-Ramen

☐ Noodles-Udon

☒ Restaurant

RESULT

 MIN GREENNESS SCORE MAX 25

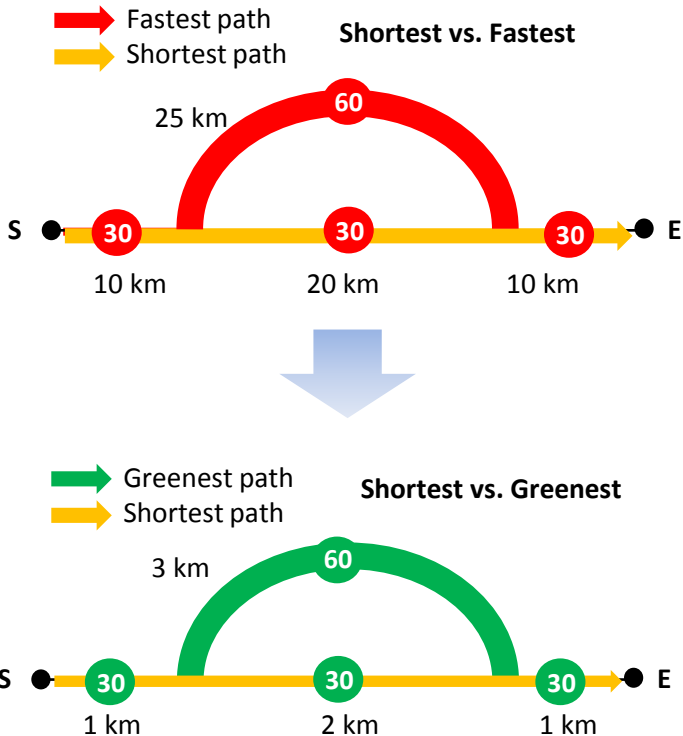
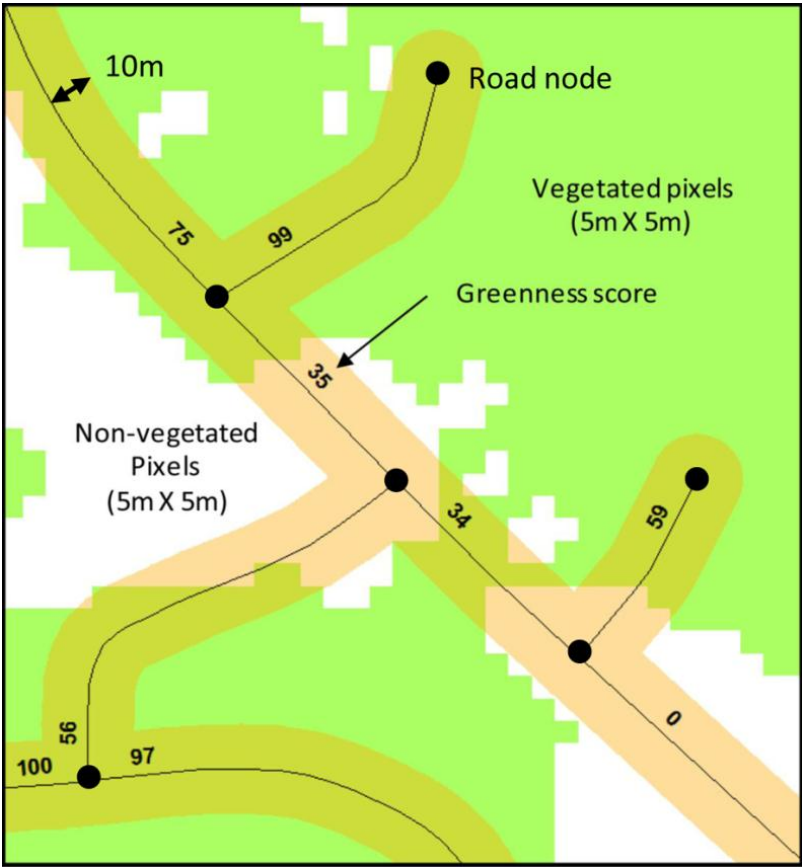
Search Point:
X = 23776.67, Y = 10164.44 ←
Radius: 350 m
Greenness Score: 25
Total Facilities: 69
Qualified Distance Shops: 54

Greenness Score = (GA / CA) * 100
*Qualified Distance:
Network distance <= User defined radius
For potential home buyers



Measurement Modes

Shortest vs. Greenest

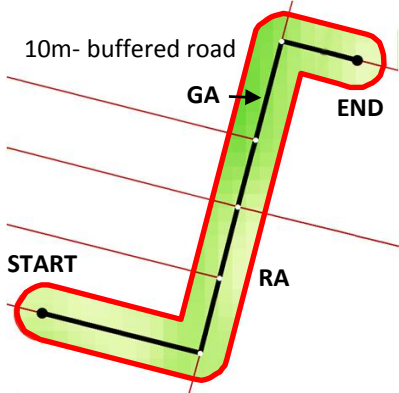


Measurement Modes

Calculation of total greenness score by route



Route greenness score

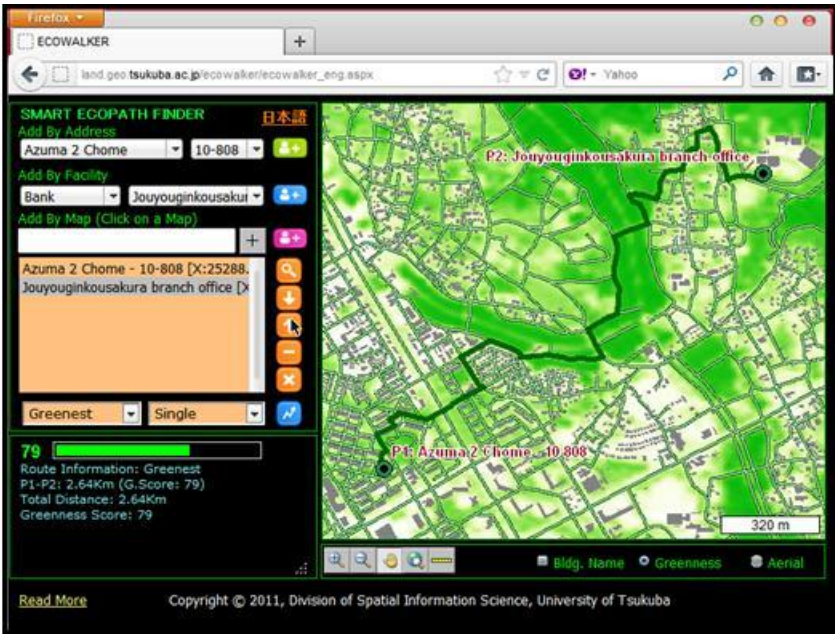
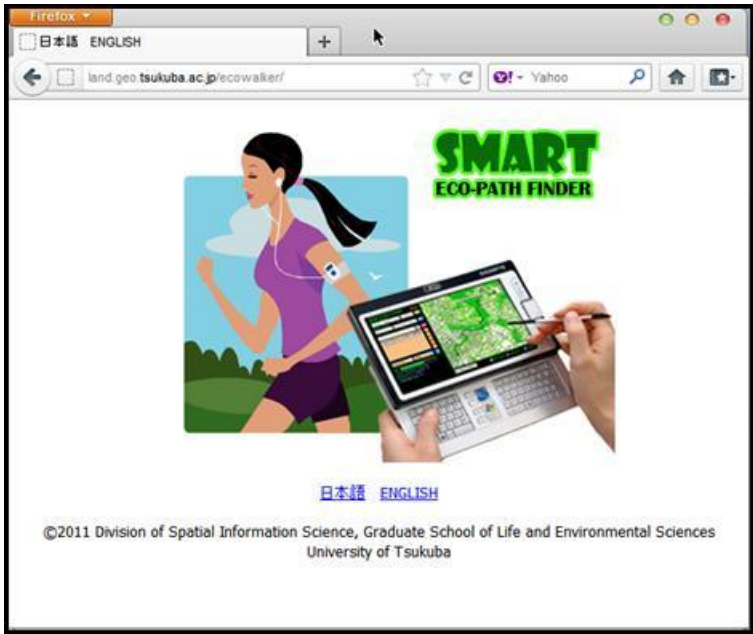


Average greenness score by walking route

Average Greenness Score = (GA / RA) * 100



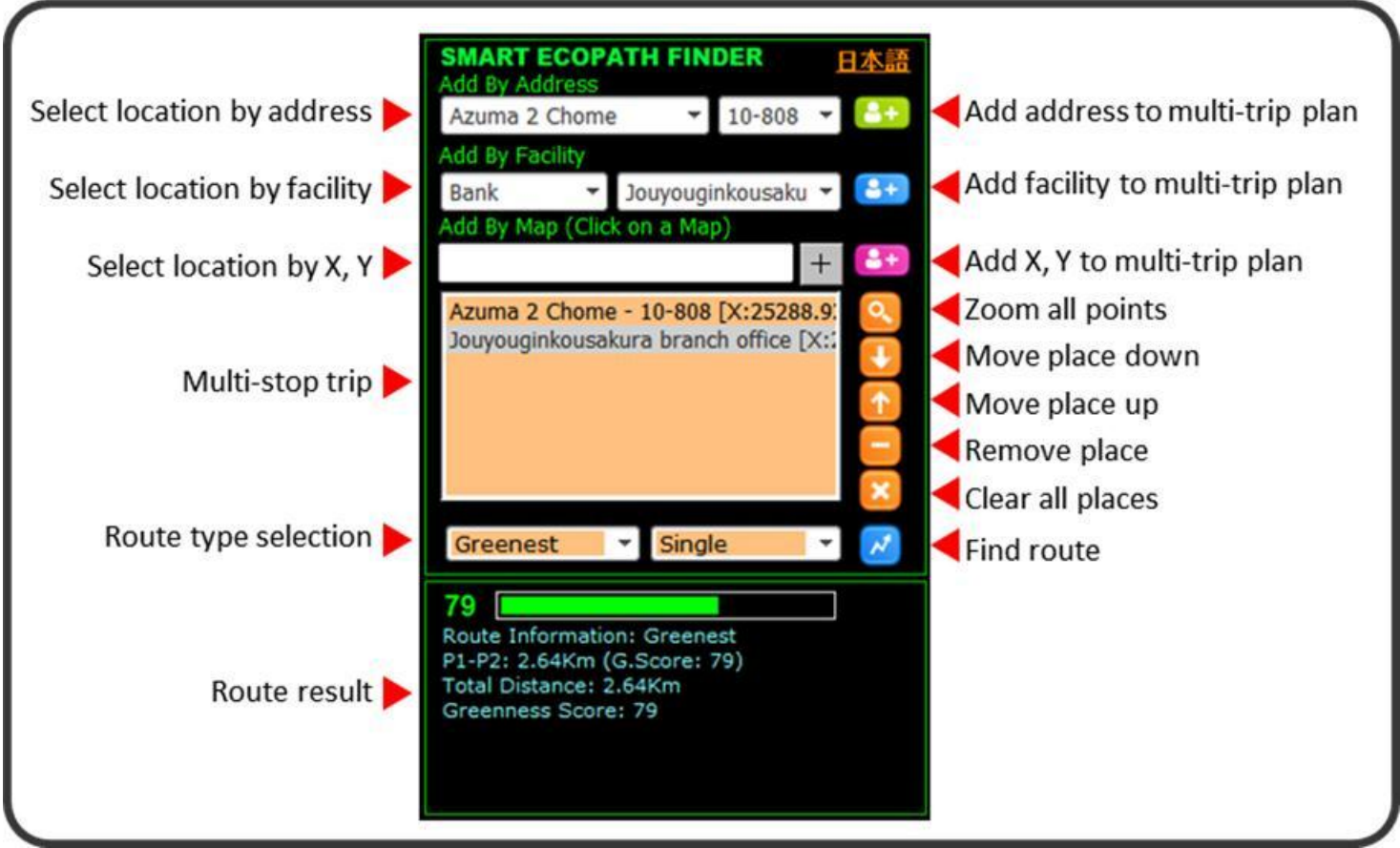
Smart Eco-path Finder



<http://land.geo.tsukuba.ac.jp/ecowalker>



Smart Eco-path Finder



Graphical User Interface (GUI)



Smart Eco-path Finder

Single Trip Planning

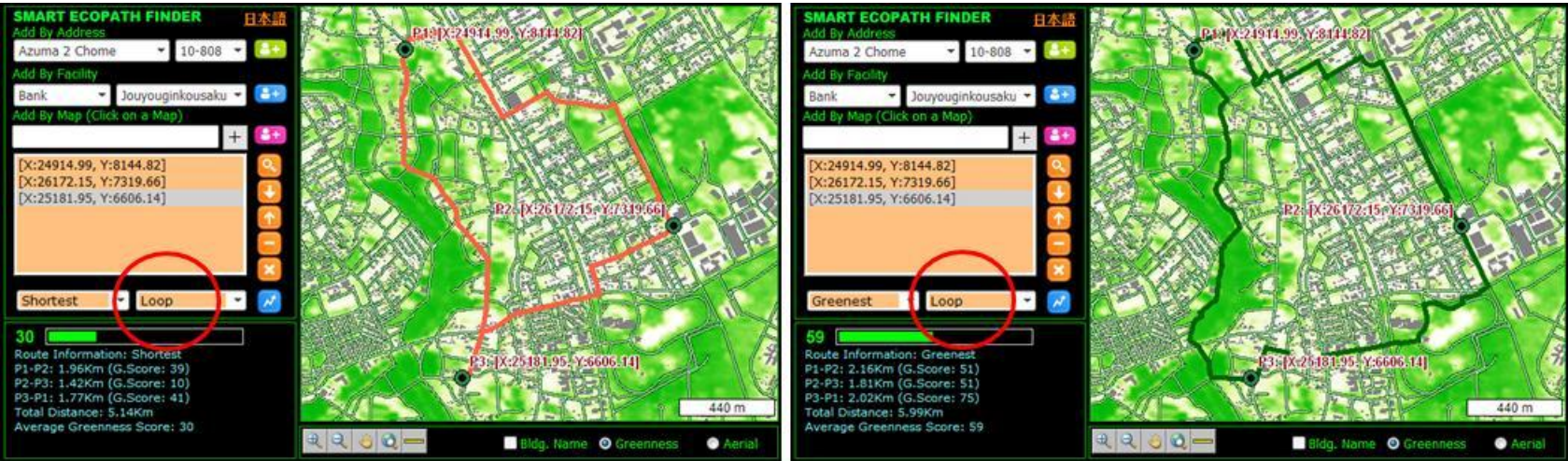


Shortest vs. Greenest



Smart Eco-path Finder

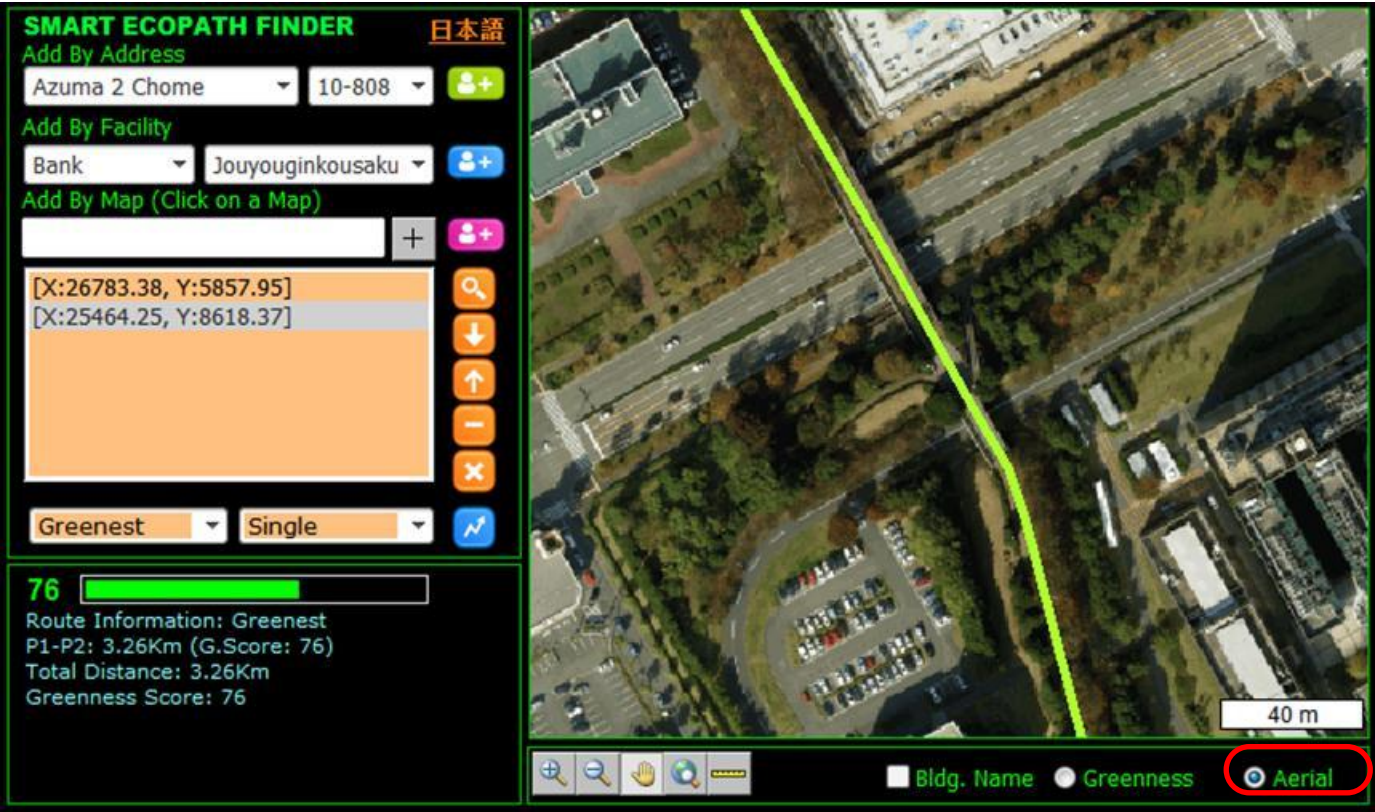
Multi-stop Trip Planning



Shortest vs. Greenest



Smart Eco-path Finder



Use high resolution satellite image as a base map for Real world visualization



Conclusion

Urban green spaces are important for **human mental health** improvement, **social cohesion**, reduce urban heat island effect, improve air quality, perform green exercises and **saving energy** by reduce cooling and heating demands.

GIST (GIScience and Technology) provides identification of green spaces, calculation of **greenness score and route path analysis** to improve local residents decision making.

Modern **spatial web technology (Web-GIS)** provides **more accessible** to a much **wider audience** than traditional GIS. The general public can now directly access spatial information and see the analysis results through their web browsers without any installation of GIS software. The system itself is **reusable and updatable**.



Thank You

**MAKE IT UNIQUE
KEEP IT SIMPLE**



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URL: <http://land.geo.tsukuba.ac.jp/ecowalkscore> (Choosing a place to live with GIS)

URL: <http://land.geo.tsukuba.ac.jp/ecowalker> (Smart Eco-path Finder)