



Slide Decks

- ▷ Professor Kitchin
- ▷ Professor Clarke
- ▷ Dr Brady
- ▷ Dr Kodate
- ▷ Dr Hughes

SMART CITIES 9.30am – 11.15am

- ▷ Rob Kitchen
The promise and perils of smart cities
- ▷ Siobhán Clarke
The role of technology and communication in enabling behavioural change for cities of the future
- ▷ Juergen Bauer
What is a Smart City beyond IT, energy and mobility management?

Coffee 11.15am – 11.30am (Ideas Space)

INCLUSIVE CITIES 11.30am – 1.15pm

- ▷ Toshio Otsuki
How should towns be arranged for a Super-Aged Society in Japan?
- ▷ Naonori Kodate
Community-based approaches to looking after older people in Tokyo
- ▷ Anne Harpur
Town Planning from a grass roots perspective: Bottom-up planning techniques that focus on community well-being and inclusion

LIVEABLE CITIES 2pm – 3.45pm

- ▷ Aidan French
Contested urban space: Nature, people and power
- ▷ Mark Hennessy
Historic towns atlases and the study of urban morphogenesis
- ▷ Ulf Strohmayer
Contemporary urbanism between 'best practice' and local customs: Public spaces in the post neo-liberal city

Coffee 3.45pm – 4pm (Ideas Space)

LIVEABLE CITIES 4pm – 5.45pm

- ▷ Brian Hughes
Past lessons and future direction for Ireland: Increasing influences in the role for cities
- ▷ James Brady
Urban agriculture in Japan: Developments and prospects for a sustainable sector
- ▷ Natsuki Shimizu
Urban lifestyle and agriculture: Public projects and policy in Kyoto



Trinity College Dublin
Coláiste na Tríonóide, Baile Átha Cliath
The University of Dublin

Welcome to the Eco-Urbanites Symposium

The Eco-Urbanites Symposium brings together a range of experts from Ireland and Japan to explore ideas of smart, liveable and inclusive cities. The event is motivated by the belief that the 'eco-city' – a sustainable city where well-being is tangible, a city which meets the many needs of its diverse citizens and their activities, is a worthy vision.

The symposium is hosted by the Trinity Centre for Asian Studies, a multidisciplinary teaching and research centre that provides a focal point for Japanese, Chinese and Korean Studies in Trinity. As Director of the Centre, I am delighted to welcome you all to Trinity College. Our university provides an excellent location for the study of the city, past, present and future. Located in the heart of Dublin in a unique campus, surrounded by ancient buildings and contemporary architecture, Trinity is the very incarnation of a smart, liveable and inclusive environment, including the symposium venue, the Trinity Long Room Hub Research Institute for the Arts and Humanities. Of course, we always want to do more, and to learn from leaders in the field. This symposium provides such an opportunity – to study practice from Japan, where social and ecological approaches to urban studies are more advanced than here in Ireland, and to hear from national Irish experts on how the city of the future can meet the needs of all citizens.

Eco-Urbanites is the first in a series of events in our university which celebrate the 60th anniversary of Japan-Ireland diplomatic relations. It is an honour for the Eco-Urbanites symposium to be counted among the officially endorsed anniversary events taking place in Ireland and Japan in 2017, and to work in association with the Embassy of Japan in Ireland in this regard. We are also particularly grateful to the Japan Foundation for their generous support towards the symposium's organization. My own interest in this field came through my work on urban multilingualism, the multilingual city. And so it just remains for me to bid each of you all a warm welcome, céad míle fáilte (one hundred thousand welcomes), ようこそ !

Dr Lorna Carson, Eco-Urbanites Symposium Convenor
Associate Professor in Applied Linguistics, Director of the Trinity Centre for Asian Studies

www.tcd.ie/Asian @TCDAsianStudies www.facebook.com/TCD.Asian



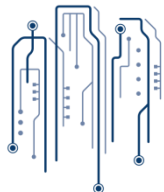
Trinity Long Room Hub
Arts & Humanities Research Institute

The Promises and Perils of Smart Cities

Rob Kitchin

National University of Ireland Maynooth

@robkitchin



The Programmable City

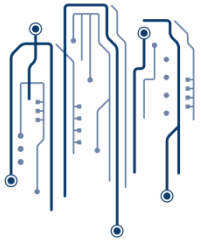


Maynooth University
National University
of Ireland Maynooth



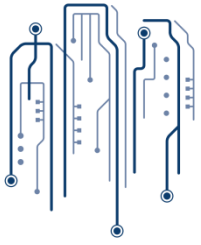
European
Research
Council





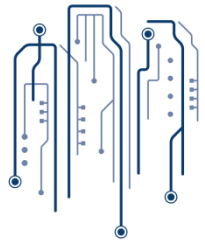
Smart cities

- Lots of definitions of smart cities. Generally encompass three dynamics:
 - Regulation and efficiency
 - Cities composed of ‘everyware’: ICT infrastructure, devices, sensors, meters, software, big data
 - Cities become networked, programmable, data-driven and thus knowable and controllable in new, dynamic, reactive ways
 - Economic development
 - Advances in ICT used to reconfigure the economy, human capital, creativity, innovation, education, sustainability, governance
 - Cities as competitive, entrepreneurial, knowledge-driven
 - Social innovation and civic engagement
 - ICT as a means for accountable governance, new forms of civic participation, new ways to solve local issues, citizen-centric tools
 - Cities as shared, open, transparent, enabling, empowering



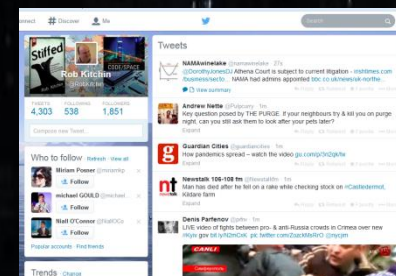
Smart city technologies

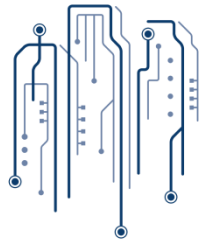
Domain	Example technologies
Government	E-government systems; online transactions; city operating systems; performance management systems; urban dashboards
Security and emergency services	Centralised control rooms; digital surveillance; predictive policing; coordinated emergency response
Transport	Intelligent transport systems; integrated ticketing; smart travel cards; bikeshare; real-time passenger information; smart parking; logistics management; transport apps
Energy	Smart grids; smart meters; energy usage apps; smart lighting
Waste	Compactor bins and dynamic routing/collection
Environment	Sensor networks (e.g., pollution, noise, weather; land movement; flood management)
Buildings	Building management systems; sensor networks
Homes	Smart meters; app controlled smart appliances
Civic	Various apps; open data; volunteered data/hacks



Urban big data

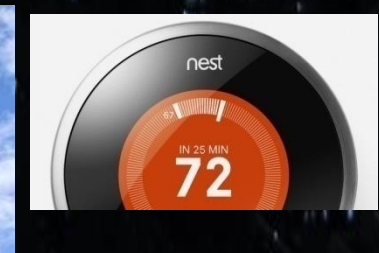
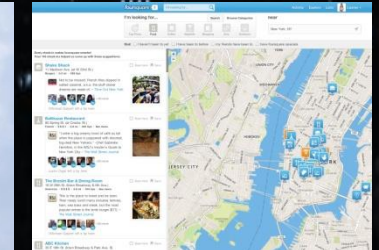
- Directed
 - Surveillance: CCTV, drones/satellite
 - Public admin records
- Automated
 - Automated surveillance
 - Digital devices
 - Sensors, actuators, transponders, meters (IoT)
 - Interactions and transactions
- Volunteered
 - Social media
 - Sousveillance/wearables
 - Crowdsourcing
 - Citizen science

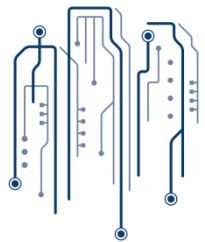




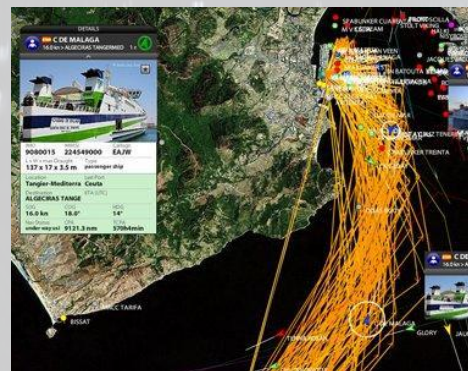
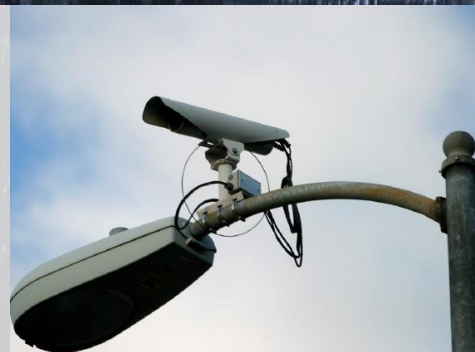
Urban big data

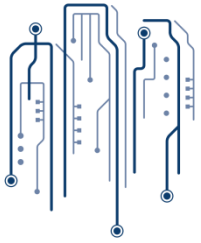
- Diverse range of public and private generation of fine-scale (uniquely indexical) data about citizens and places in real-time:
 - utilities
 - transport providers, logistics systems
 - environmental agencies
 - mobile phone operators
 - app developers
 - social media sites
 - travel and accommodation websites
 - home appliances and entertainment systems
 - financial institutions and retail chains
 - private surveillance and security firms
 - remote sensing, aerial surveying
 - emergency services
- Producing a data deluge that can be combined, analyzed, acted upon



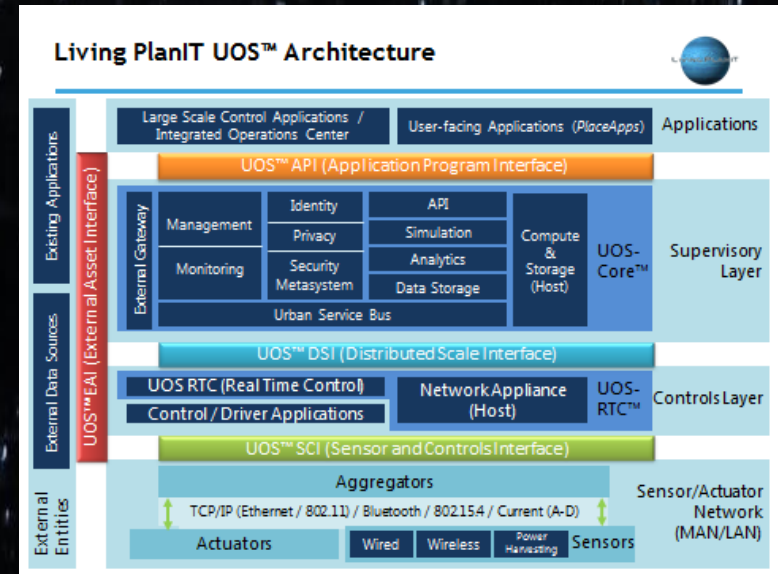
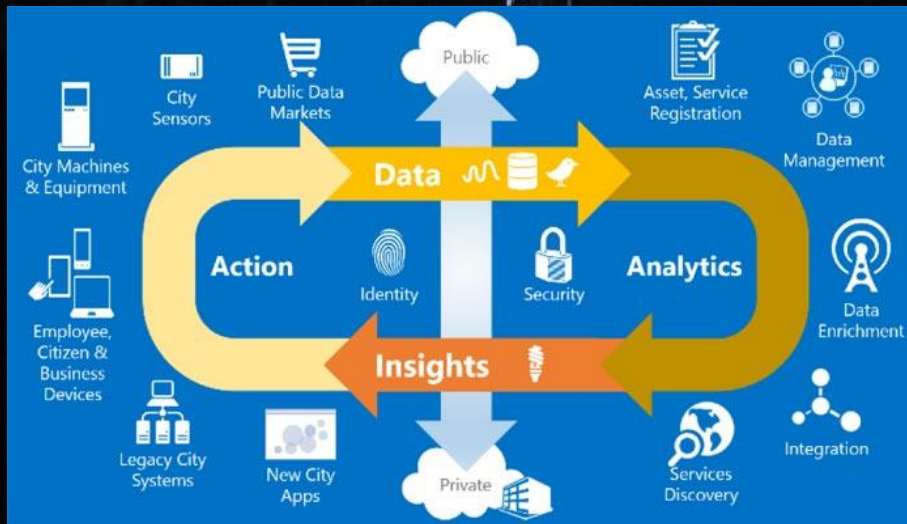
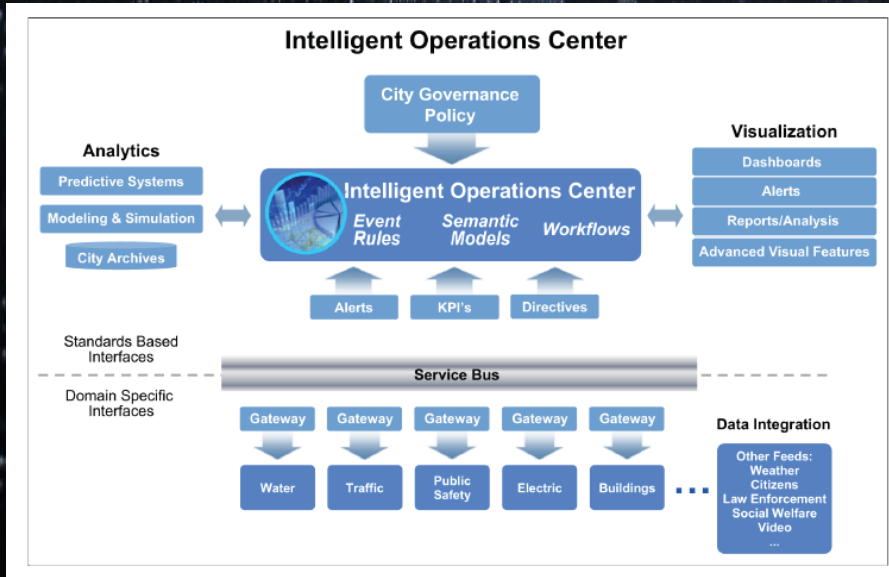


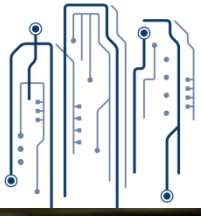
Single domains





Integrated, city & sector wide





Networked, programmable, data-driven cities



Homepage

About DublinDashboard

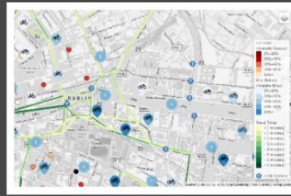
Share



Dublin Overview



How's Dublin Doing?



Dublin RealTime



Dublin Mapped



Dublin Planning



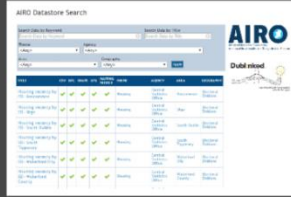
Dublin Near To Me



Dublin Housing



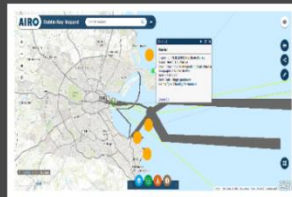
Dublin Reporting



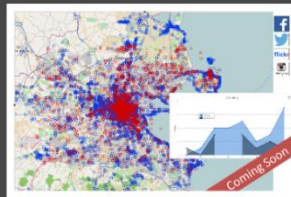
Dublin Data Stores



Dublin Apps



Dublin Bay Dashboard



Dublin Social (Coming Soon)

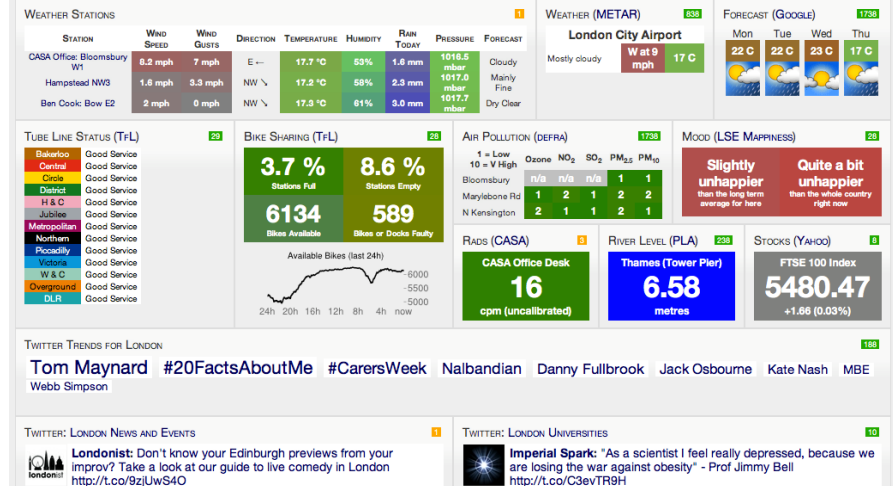


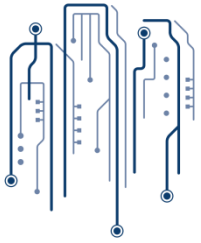
London

51.51 N, 0.13 W

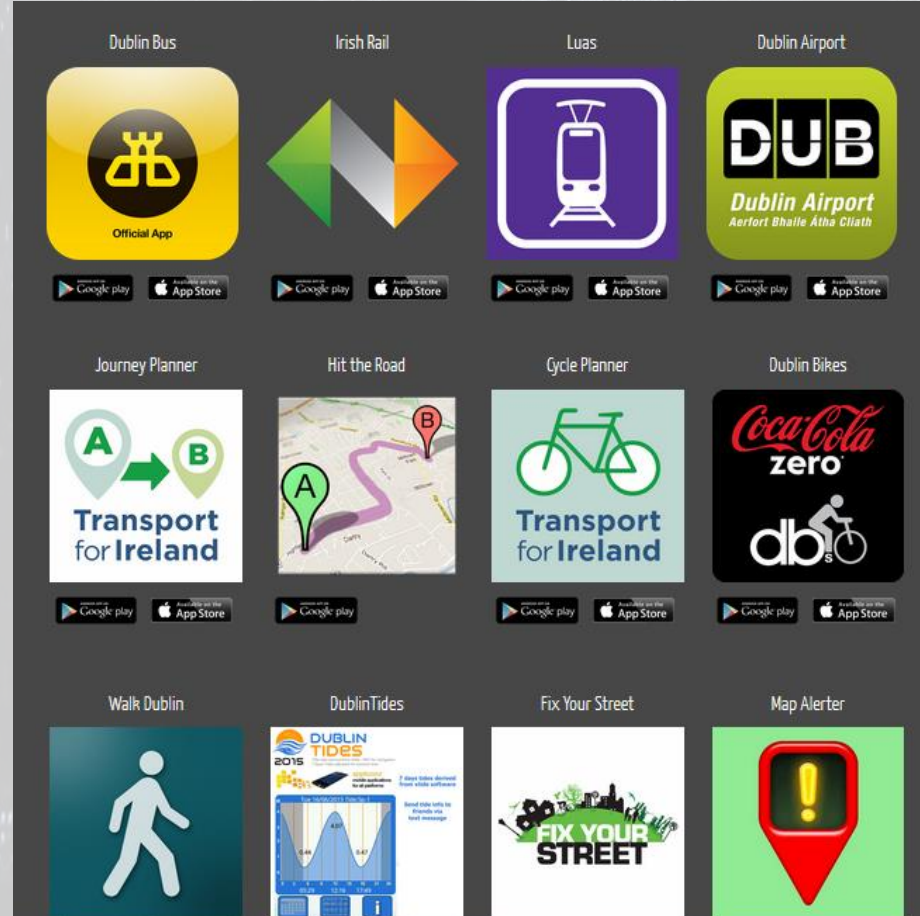
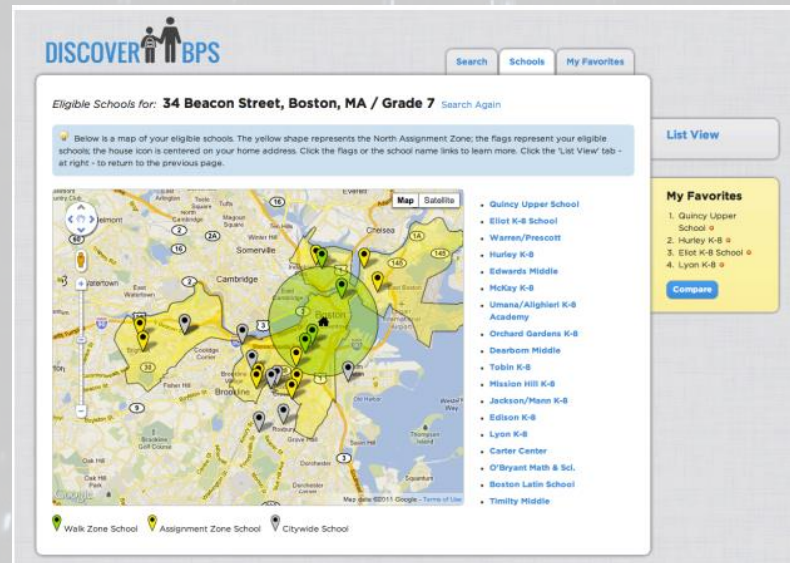
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Go to Map - Go to Grid - Change City

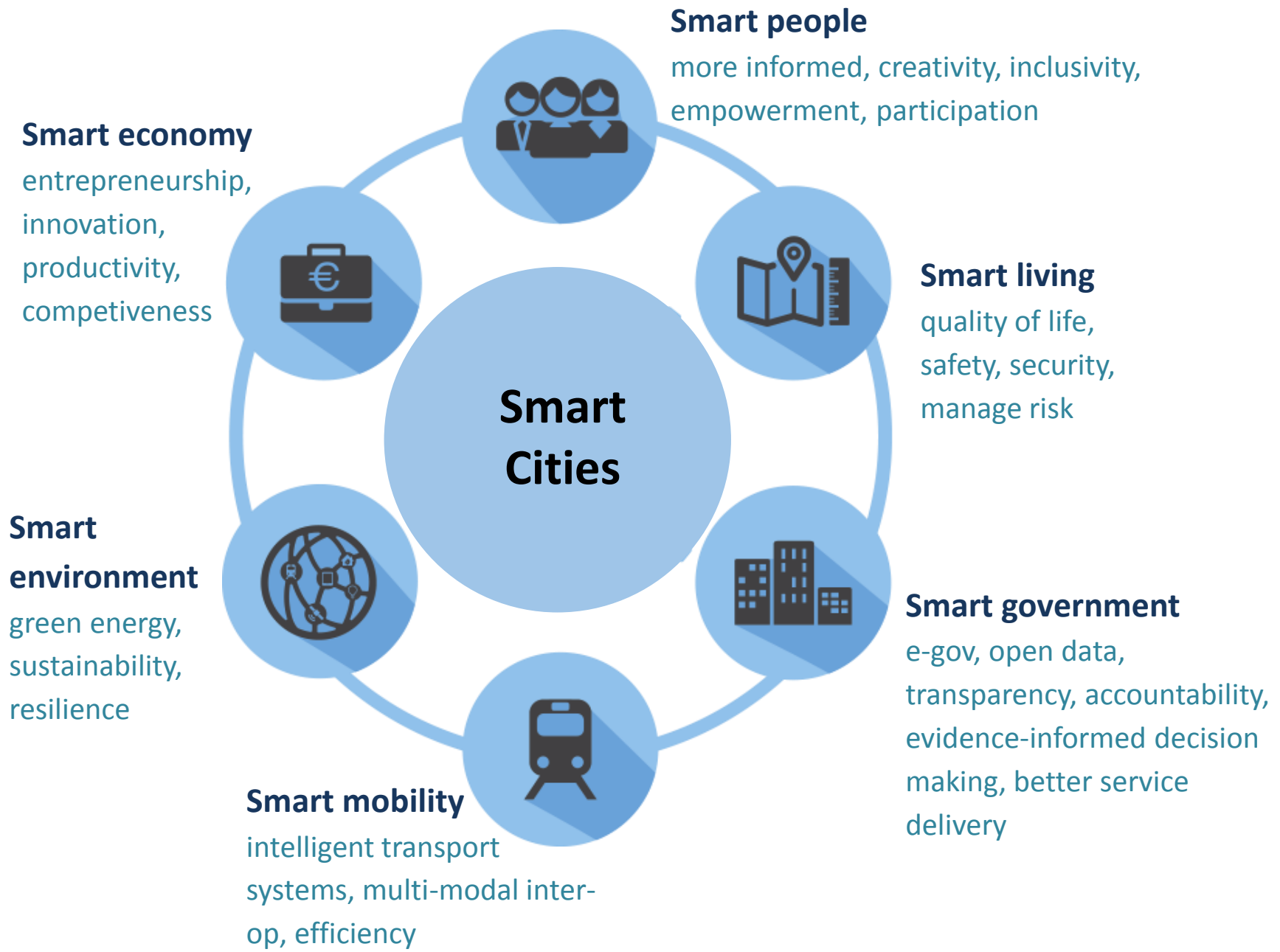


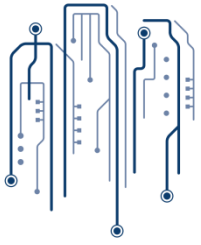


Smart city apps



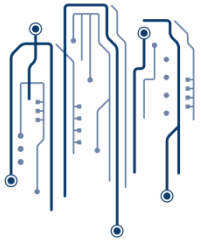
Promise of smart urbanism/cities





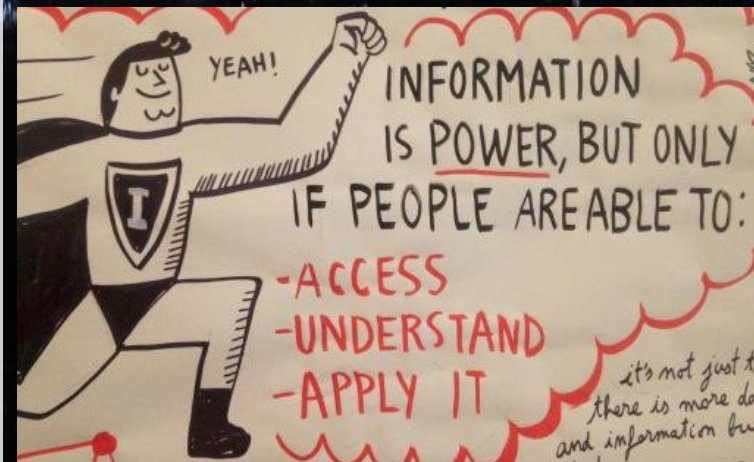
Critiques of smart cities

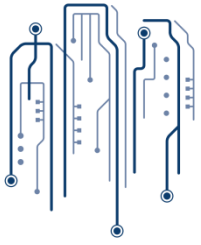
- Operational/practical concerns
- Data quality and provenance
- City as a knowable, rational, steerable machine
- Objective, neutral, non-ideological approach
- Technocratic governance and solutionism
- Neoliberal political economy & corporatisation of governance
- Ahistorical, aspatial, homogenizing and bounded
- Scalar and stakeholder issues
- Reinforce power relations & inequalities
- Ethics
- Hacking the city
- Normative framing



Operational/practical concerns

- Data and systems governance
- Internal vs external facing
- Access to data
- Data ontology and interoperability; standards
- Data quality and veracity
- Resourcing, capacity & sustainability issues (staff, finance, infrastructure)
- Obstacles (institutional culture, legacy systems, resistance, politics)
- Data literacy and analytical competency (staff & public)
- Making data actionable - from data to tools; from browsing to answers

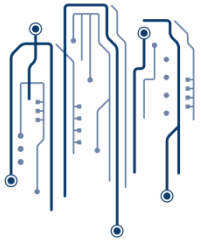




City as a knowable, rational, steerable machine?

- From a smart city perspective a city:
 - Is a system of systems
 - is a set of knowable and manageable systems that act in rational, mechanical, linear & hierarchical ways
 - can be steered & controlled through technical levers
 - urban issues can be solved with technical solutions
 - is a generic analytical category
- However, cities:
 - are places; complex and ever-evolving, full of inter-dependent, contingent and relational actors, actants, processes and relationships
 - full of culture, politics, competing interests, and wicked problems
 - difficult to predict & develop in capricious ways
 - have different histories, cultures, economies, politics, legacy infrastructures, political and administrative geographies, interconnections and interdependencies with other places

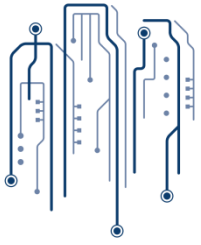




Technocratic governance and solutionism

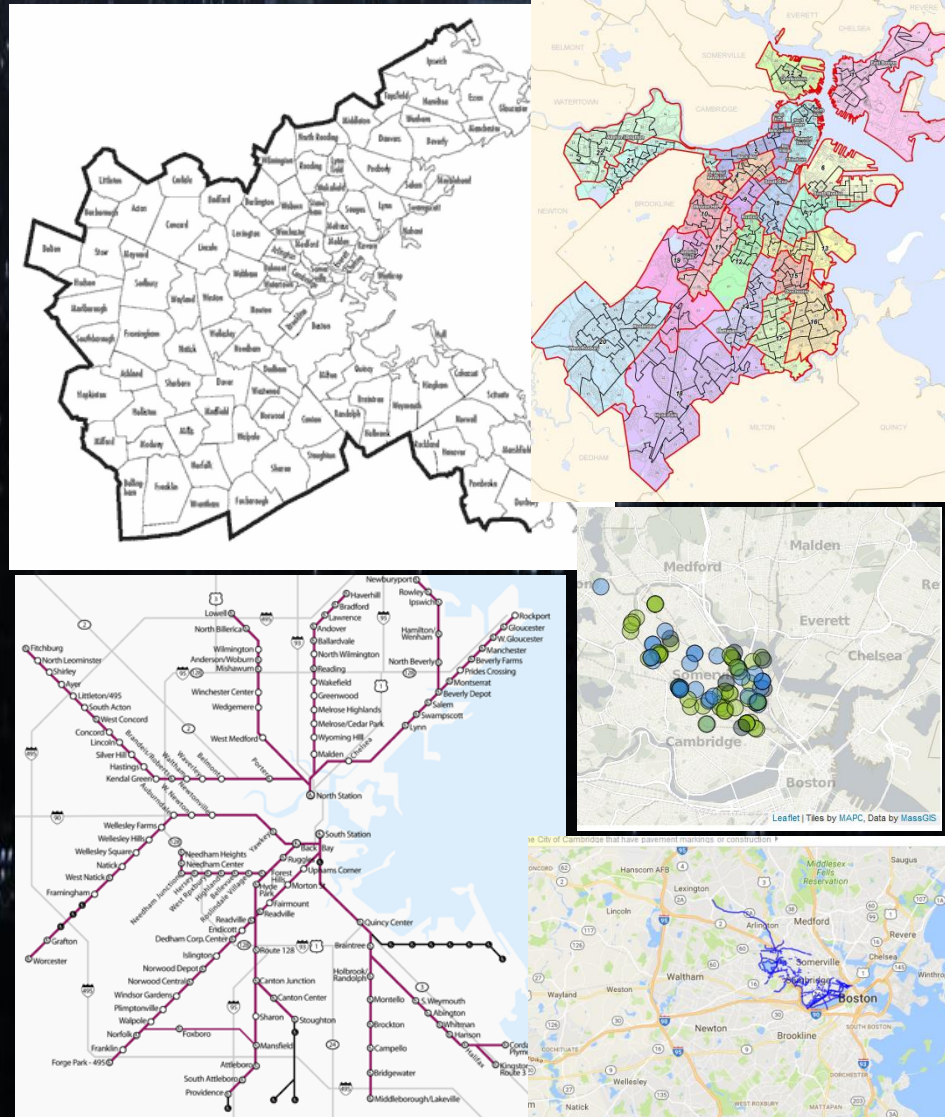
- Smart city technologies generally enact algorithmic & KPI-driven governance and forms of automated management. These:
 - technology the optimal solution for solving city problems
 - facilitate and produce instrumental, functionalist, technocratic, top-down forms of governance & government, inc. planning
 - Underpinned by ethos of stewardship (for citizens) or civic paternalism (what's best for citizens)
 - Often provide 'sticking plaster' or 'work around' solutions, rather than tackling root & structural causes
- Needs:
 - co-creation, co-production, citizen engagement
 - be open and transparent in their formulation and operation
 - be used in conjunction with a suite of aligned interventions, policies and investments that seek to tackle issues in complementary ways
 - Need to be set within wider long-term plan/vision for the city

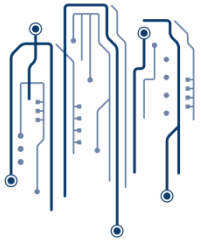




Scalar and stakeholder issues

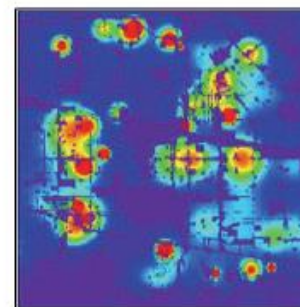
- Fractured landscape
- With respect to geography
 - Back-to-back services and planning across municipalities
 - Scalar organisation - local, county, regional, state, federal
 - Mismatch of functional territories and administrative geographies
- With respect to stakeholders
 - Within municipalities, across municipalities, with public sector agencies, industry, universities, NGOs, community organisations
 - Different goals, resources, practices, institutional structures, funding models, etc.
- Variations in data ontologies within and between scales/stakeholders
- Lack of joined up smart city systems
- Sub-optimal planning



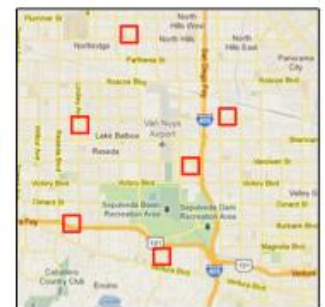


Ethics and security concerns

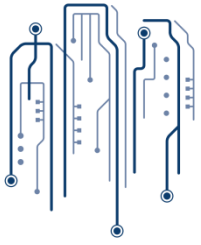
- Smart city systems create a number of ethical and security concerns
 - Surveillance and erosion privacy
 - Ownership, control, data markets
 - Social sorting / redlining
 - Anticipatory governance
 - Nudge / behavioural change
 - Dynamic pricing
 - Data security
 - Control creep
 - Buggy, brittle, hackable urban systems
- Need to consider these vis-à-vis a planning ethos & praxes



TACTICAL AMBIGUITY
rear-view mirror heat map

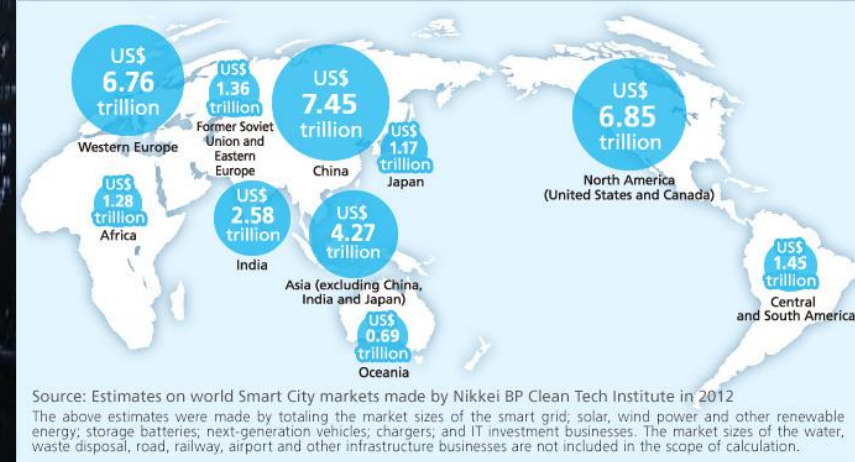


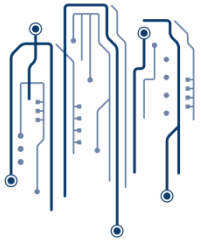
TACTICAL CLARITY
forward-looking PredPol boxes



Goals

- Normative questions
- For whom and what purpose are smart cities being developed?
- Are smart cities primarily about - or should be about:
 - creating new markets and profit?
 - facilitating state control and regulation?
 - improving the quality of life of citizens?
- What kind of cities do we want to create and live in?
 - Not simply from an instrumental perspective, but with respect to issues such as fairness, equity, justice, citizenship, democracy, governance and political economy





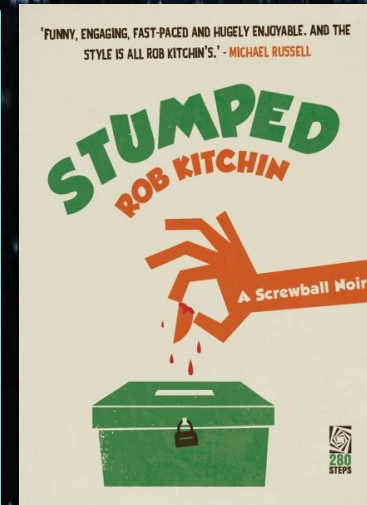
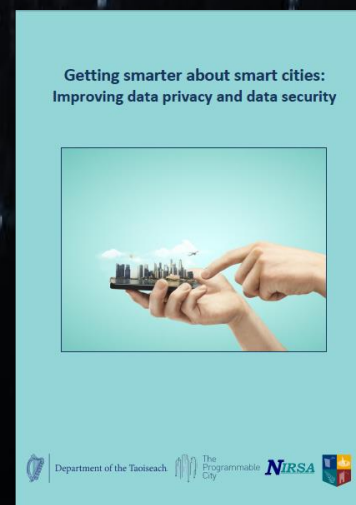
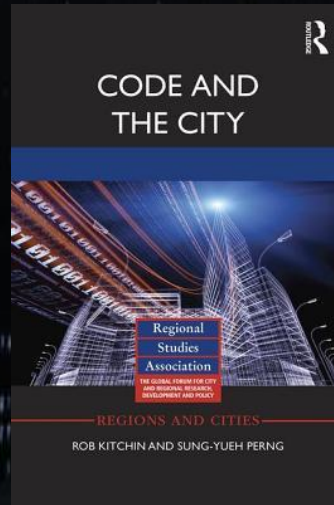
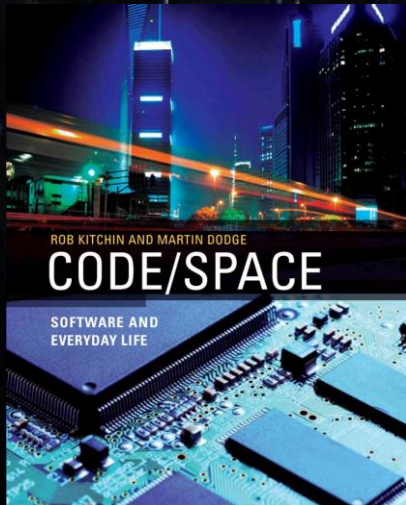
Conclusions

- Cities around the world are increasingly utilising smart city technologies to solve urban issues
- Such technologies offer opportunities for addressing urban issues and managing/governing cities
- They also raise a number of practical, instrumental, conceptual, ethical and normative questions
- As the new era of smart urbanism emerges it is important to consider these issues and to maximize the benefits while minimizing the pernicious effects



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<https://www.maynoothuniversity.ie/people/rob-kitchin>



<http://progcity.maynoothuniversity.ie>
@progcity



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Trinity College Dublin
Ollscoil Átha Cliath | The University of Dublin



The role of technology and communication in enabling behavioural change for cities of the future

Prof. Siobhán Clarke

School of Computer Science and Statistics



Today's cities – problem!

Cost of Congestion



In 2007, congestion induced economic losses in Dublin were valued at 4% of GDP

Ageing Population



In 2000, 6.9% of world's population 65+
By 2050, 15.6% of world's population 65+



Population Growth



180,000 people move to cities every day
By 2050, ~75% of population will live in cities

Ecological Footprint



- World uses 50% more resources than can be sustainably produced
- High-income countries average five times that of low-income ones

Municipal Waste

The average EU citizen generated 468 kg of municipal solid waste in 1995, which could rise to 558 kg per person by 2020.

Urban Sprawl



Countries with lowest population density have highest traffic CO₂ emissions
Urban sprawl has negative impact on cost of public services

Air Pollution Deaths



- Overall, world premature deaths will increase from ~150 to ~390 per ml from 2000 to 2030
- Europe/US project slight decreases – China at extreme end of increases (250-880)

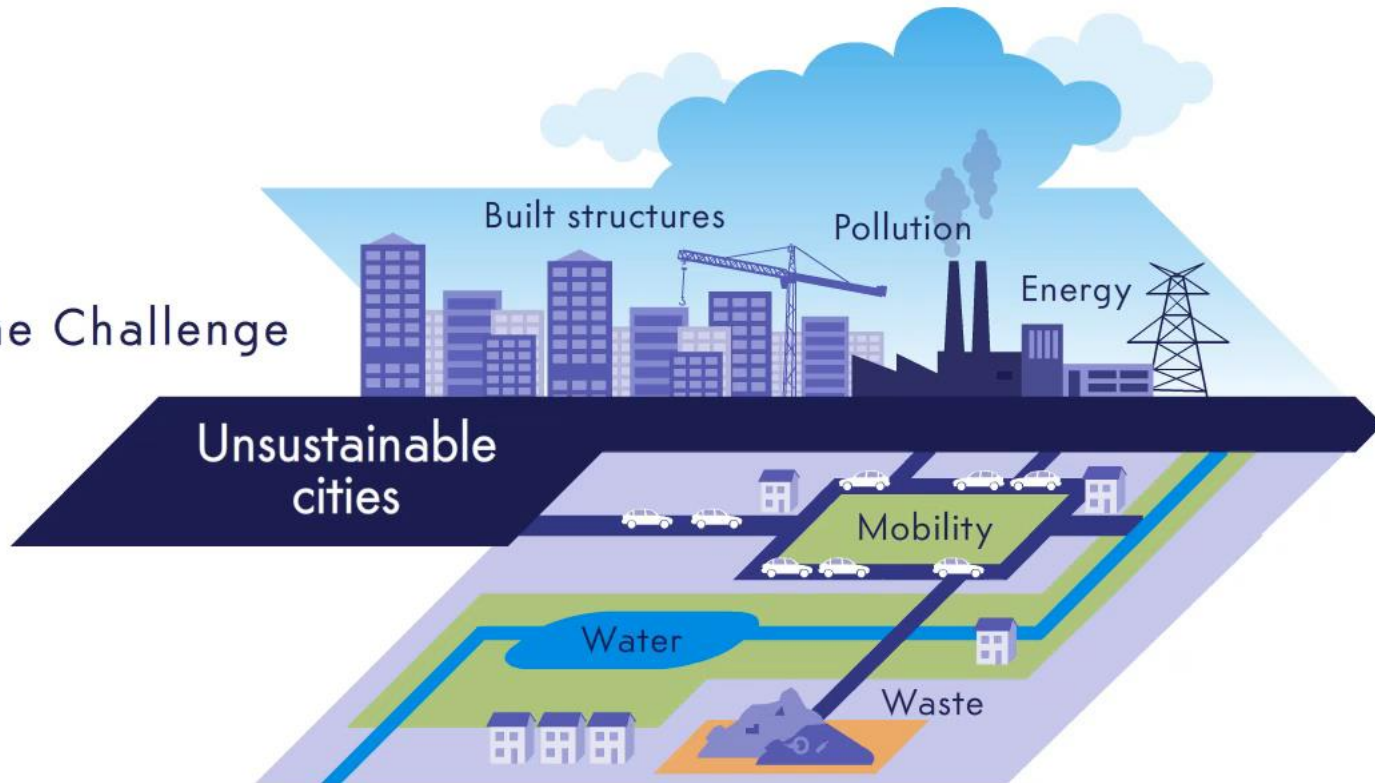
We have to change the
way we use
shared, constrained
city resources

Autonomous behavioural change?



Mobility example

The Challenge



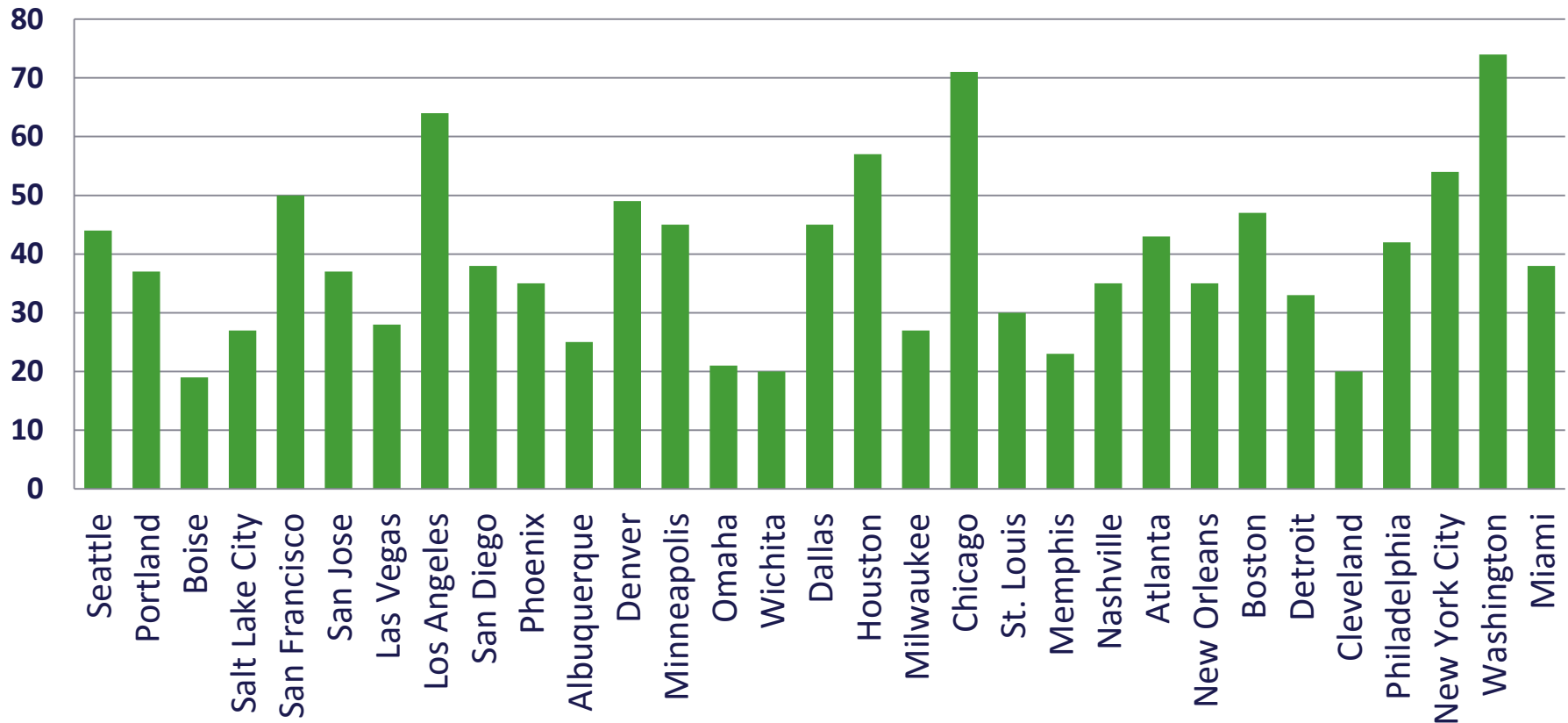
“Modern” Society



Source: Pandagon

Economic Cost

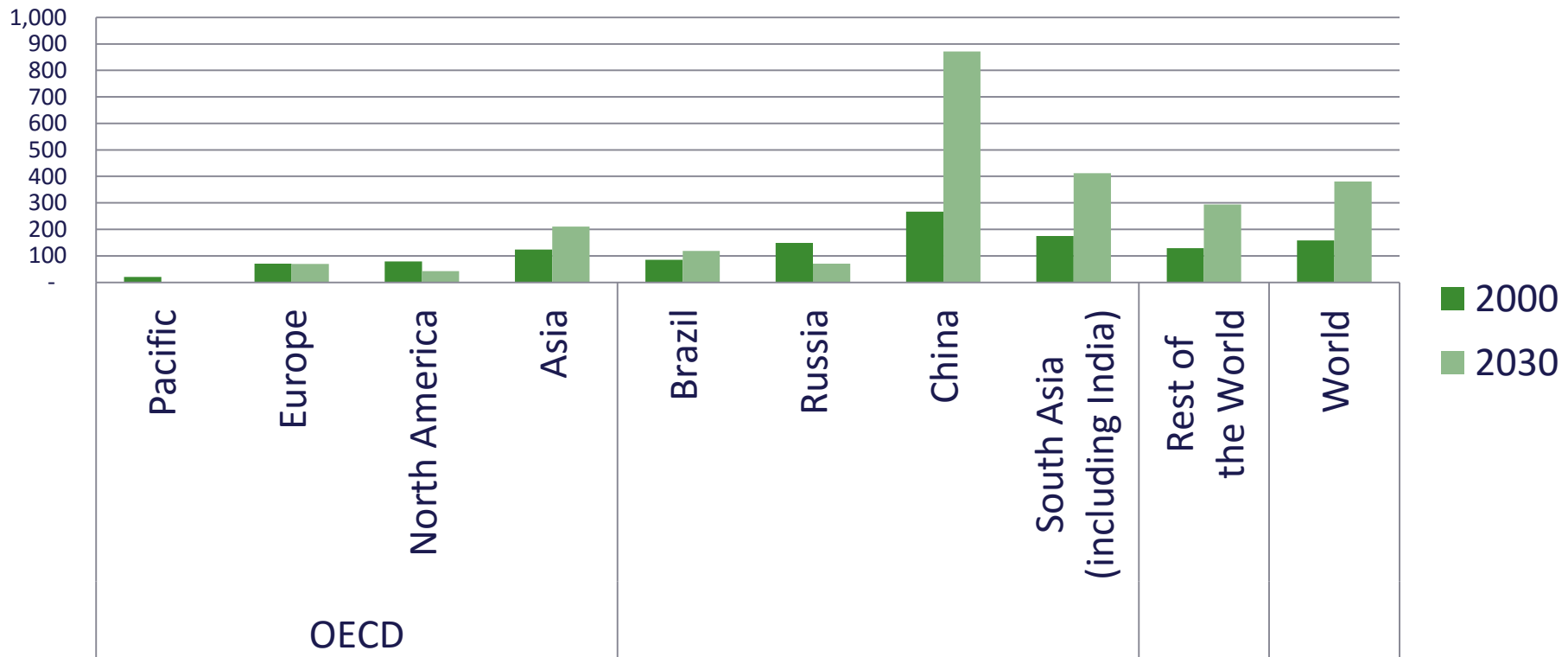
Average time (hours) wasted in congestion every year



Source: Texas Transportation Institute, Urban Mobility Report 2009

Environmental Cost

Premature deaths from PM10 air pollution for 2000 and 2030 (cases per million inhabitants)



Source: OECD, The OECD Environmental Outlook to 2030, 2008

Human Cost

- Road Traffic Injuries
 - 90% of accidents are caused by human factors ¹
- Total traffic deaths
 - 1.2 - 1.3 million per year ²

¹ Bob Joop Goos , Chairman of the International Organisation for Road Accident Prevention, 2011

² Peden et al., WHO, 2002

Smart Vehicles



Under the bonnet

How a self-driving car works

Signals from **GPS (global positioning system)** satellites are combined with readings from tachometers, altimeters and gyroscopes to provide more accurate positioning than is possible with GPS alone

Radar sensor

Ultrasonic sensors may be used to measure the position of objects very close to the vehicle, such as curbs and other vehicles when parking

The information from all of the sensors is analysed by a **central computer** that manipulates the steering, accelerator and brakes. Its software must understand the rules of the road, both formal and informal

Lidar (light detection and ranging) sensors bounce pulses of light off the surroundings. These are analysed to identify lane markings and the edges of roads

Video cameras detect traffic lights, read road signs, keep track of the position of other vehicles and look out for pedestrians and obstacles on the road

Radar sensors monitor the position of other vehicles nearby. Such sensors are already used in adaptive cruise-control systems

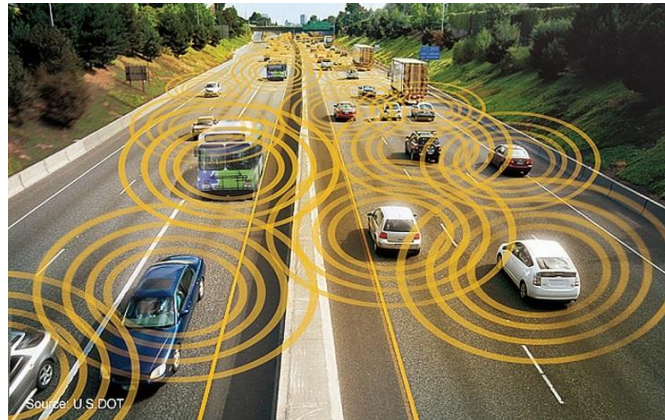
Source: *The Economist*

What if?



Source: Zurich insurance, used with permission

Cooperating Vehicles



Less congestion



Saving time



Fewer crashes



Increased safety



Reduced pollution



Green transport



Why coordination?

- A solitary smart vehicle can only estimate the actions of other vehicles from noisy sensor data
- Coordination between smart vehicles can
 - Improve traffic safety through determinism
 - Improve traffic efficiency through planning and advance knowledge

However, **coordination is hard**

Why is coordination hard?

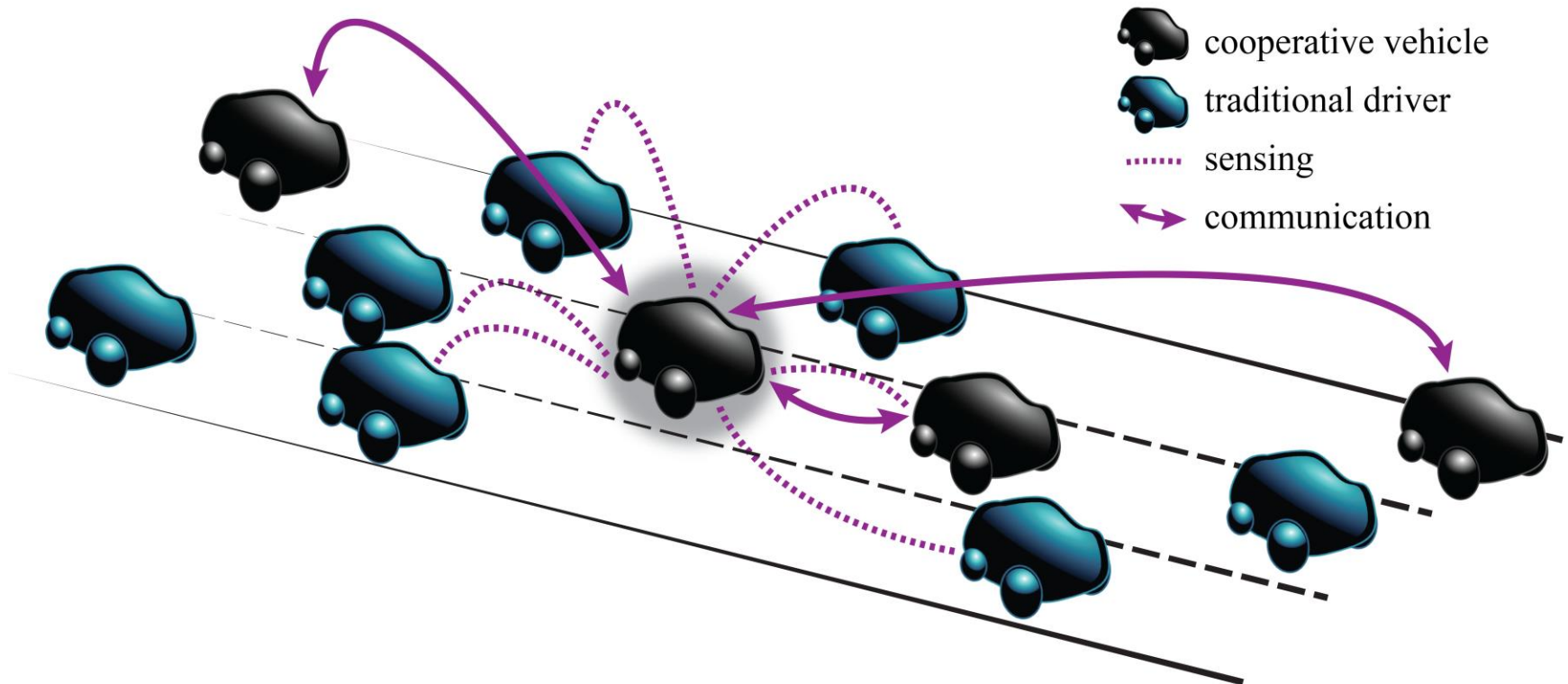
Smart vehicles operate in a challenging environment

- Noisy sensors and actuators
- Real-time constraints
- Unreliable communication
- Dynamic participants
- Interaction with human drivers
- Ever-changing surroundings
- Developing distributed algorithms is difficult and error-prone



Most important of all: **Driving is safety-critical**

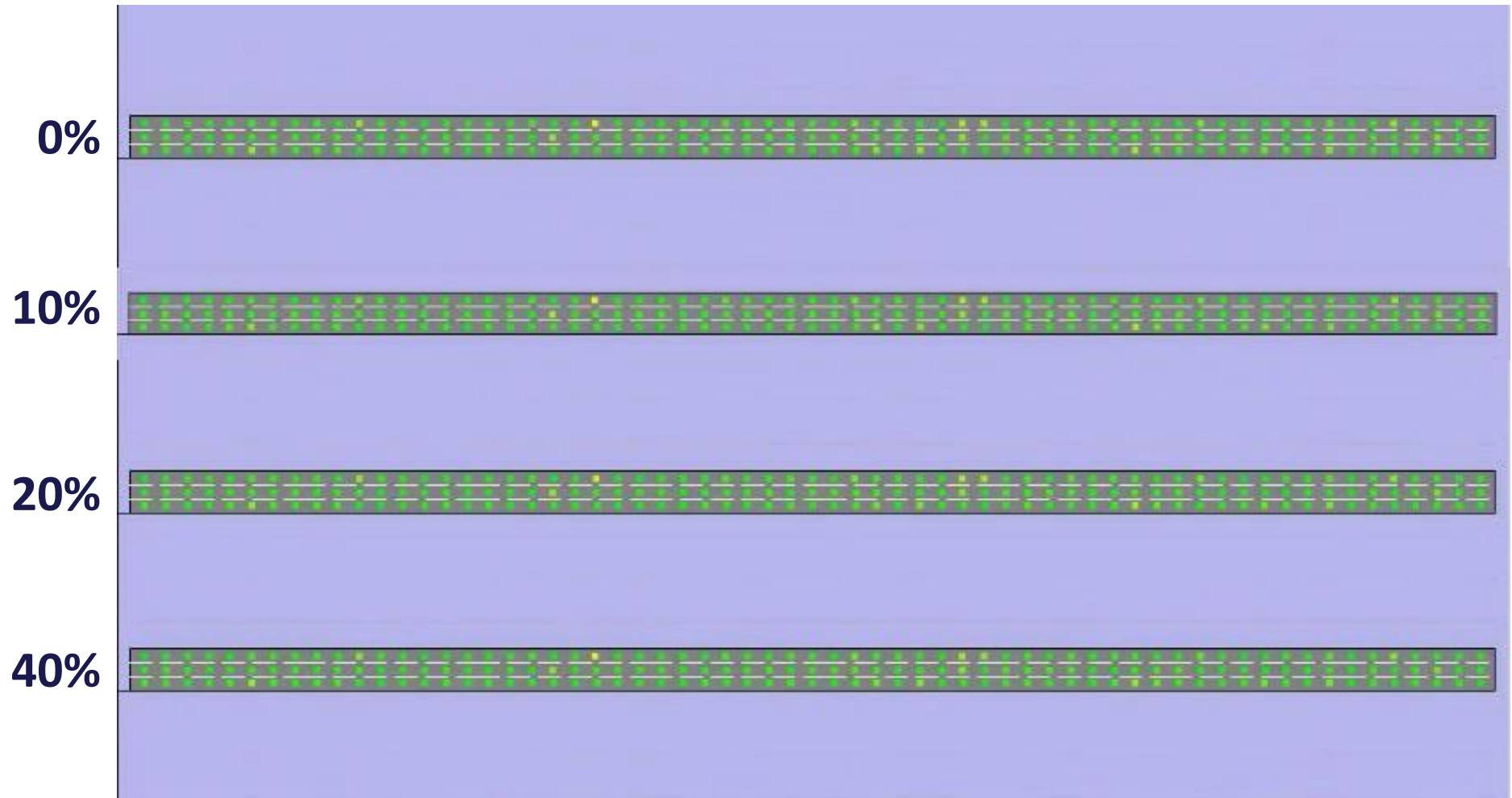
Mixed traffic



Unreliable communication
Noisy sensors
Different driving behaviours

Safety critical!

Cooperative Car Following



Cooperative Lane Changing

0%



20%

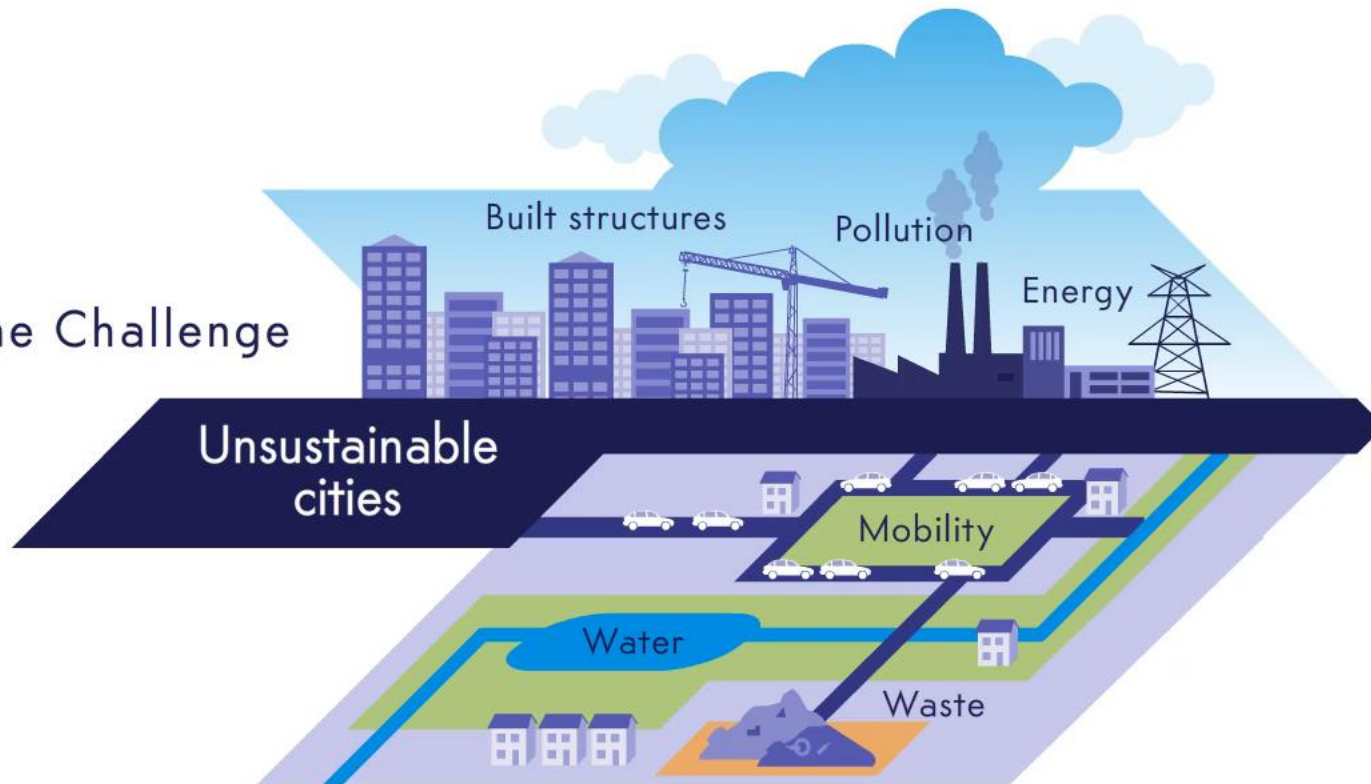


Conclusions *(mobility)*

- Transport and congestion have a very high impact on quality of life, which is increasing with urbanisation
- New technologies can be exploited to mitigate this, by providing personalised information & feedback
- Eventually also by allowing vehicles to collaborate and use roads better

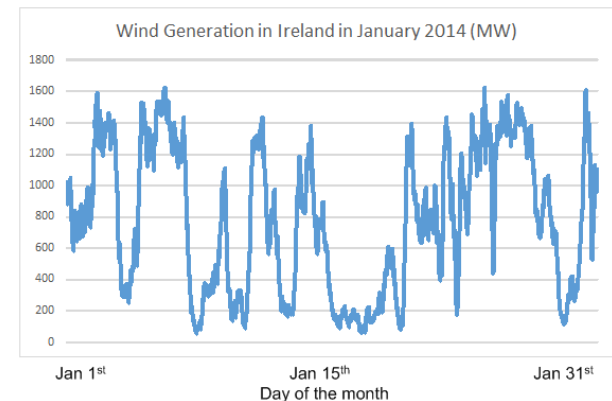
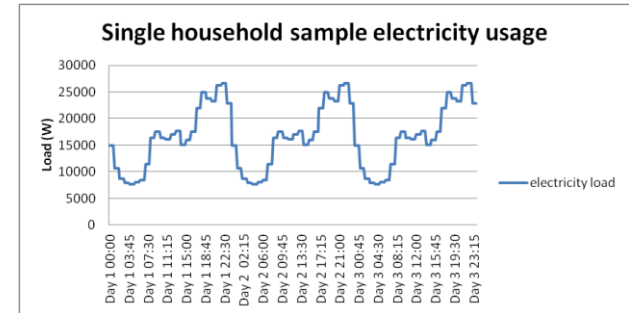
Energy example

The Challenge



Demand Side Management

- Energy usage not distributed evenly during the day – morning peak, large evening peak, valley during the night
- Renewable energy generation not evenly distributed and intermittent – depends on weather
- Demand side management (DSM): modification of consumers' electricity consumption with respect to their expected consumption
 - peak clipping, valley filling, load shifting ...
- Based on prediction:
 - influence consumers to **reschedule/defer loads** that are not essential during the peaks and run them during low demand periods instead
 - or **use wind-generated energy just-in-time** to avoid using storage or curtailing generation

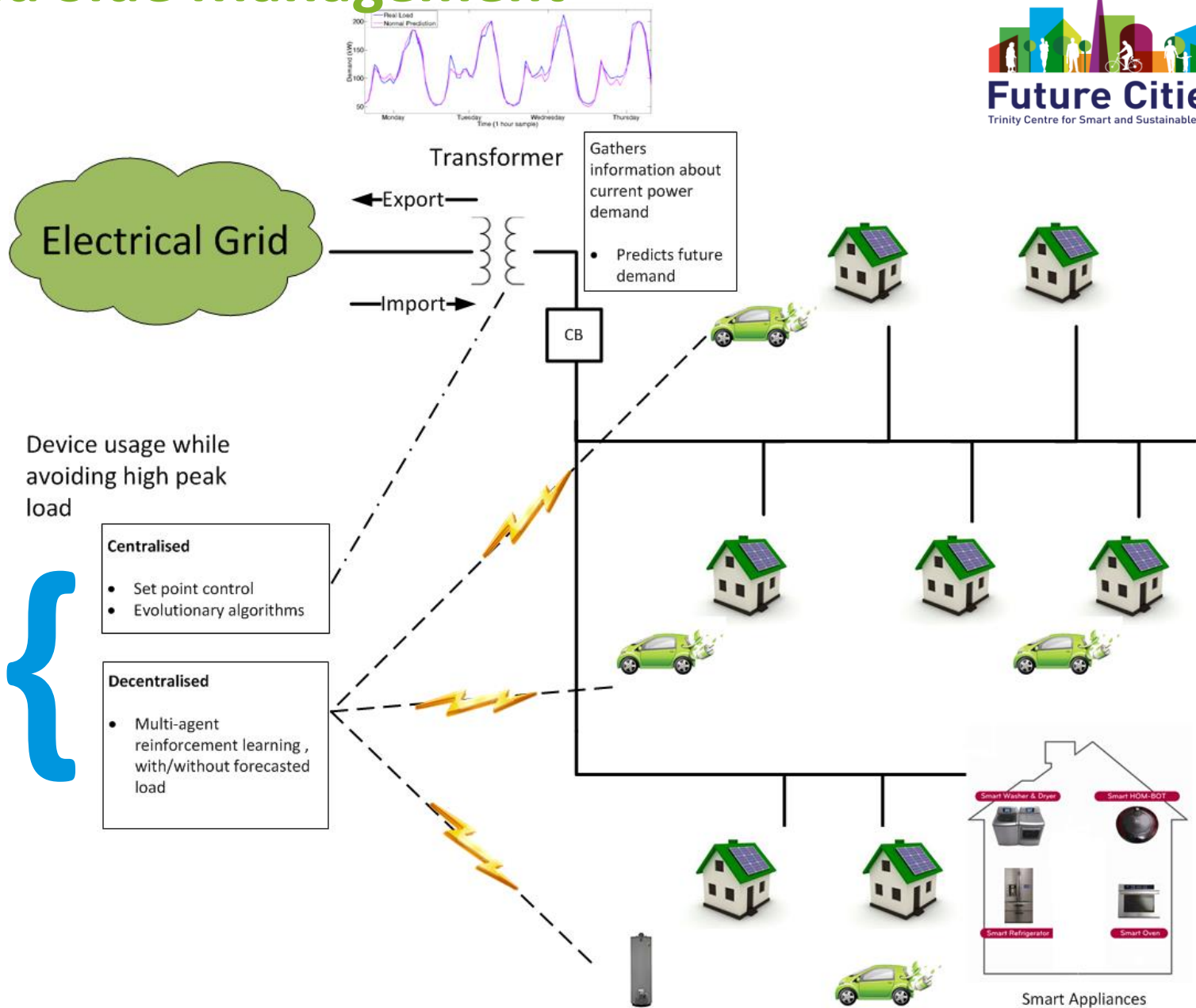


Aggregation

- In aggregate, individual devices can be a significant amount of energy
- Aggregated load can exploit scale to bid for preferential rates
- Gain access to DR money in markets
- Distributed generation can be better accommodated through aggregated demand

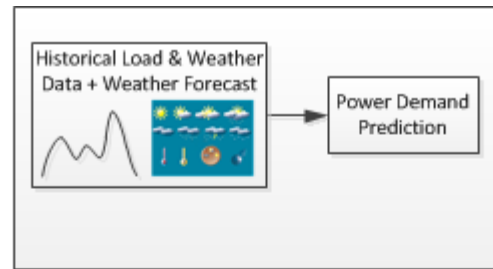
Demand Side Management

Explored
centralised and
decentralised
algorithms in
different
circumstances



Decentralised approaches

Load Forecasting



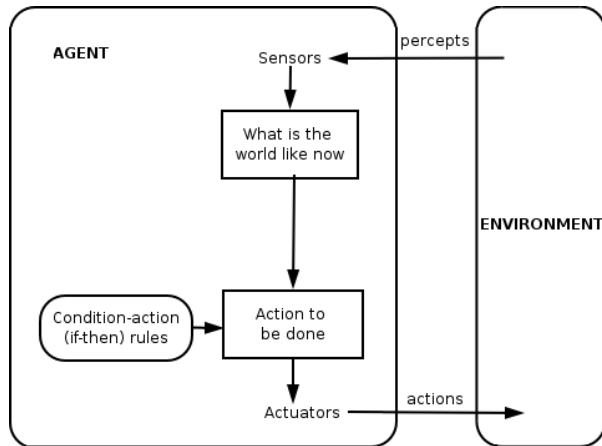
*Improving learning
performance*



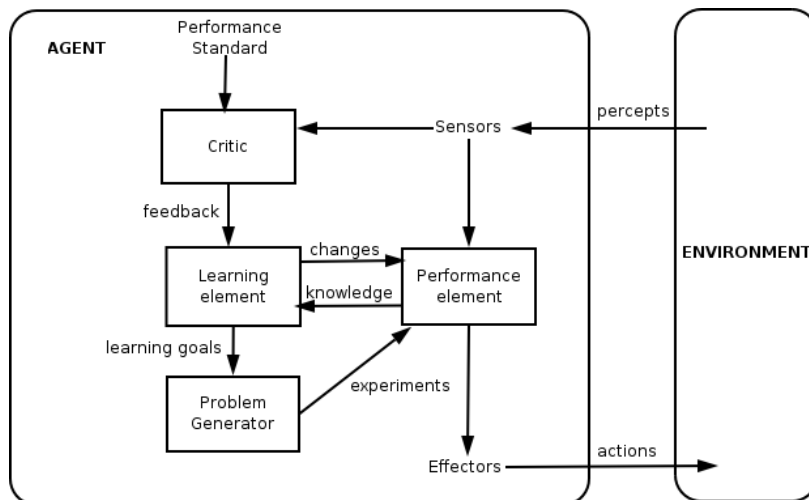
Reinforcement learning
based Multi-agent
system for DSM

*Residential demand-side
management*

Decentralised Multi-Agent Systems



MAS: Simple Reflex Agent

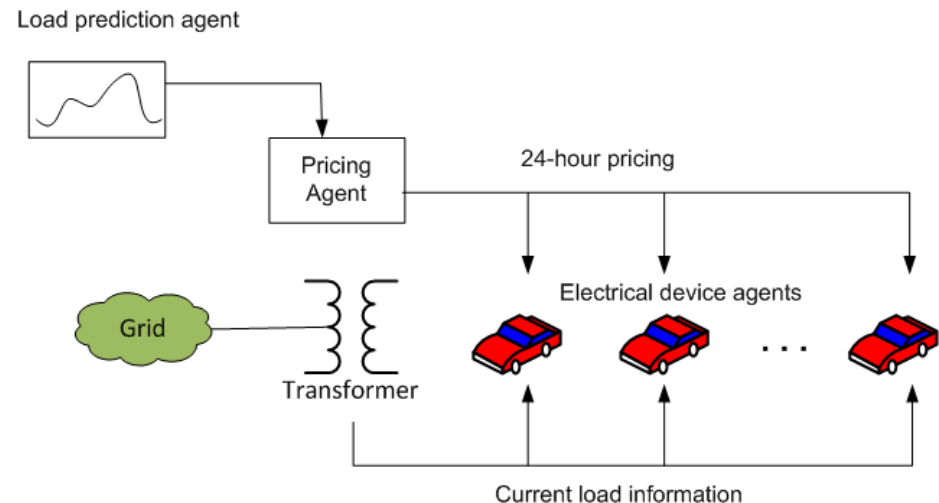


MAS: Learning Agent

- Multi-policy optimisation
- Based on Reinforcement Learning
- Collaboration for Distributed Learning
- Models for improving speed of learning
- Applied to traffic control and to energy micro grids.

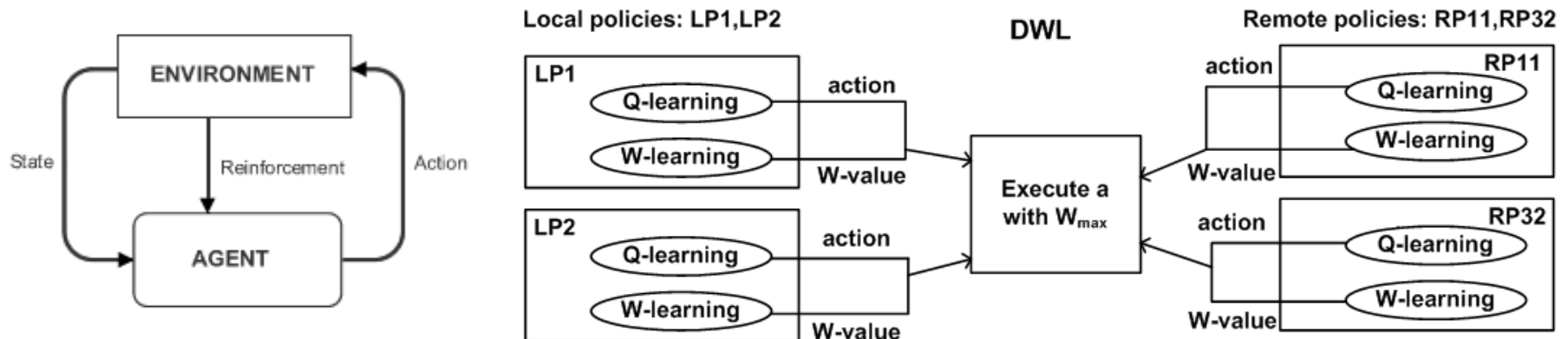
Decentralised: Multi-agent residential demand side management based on load forecasting

- Implement the grid as a multi-agent system - each EV is controlled by an RL-agent which implements 3 policies:
 - Policy 1: achieve at least the minimum required battery charge
 - Policy 2: charge at the minimum possible price/during the lowest load
 - Policy 3: keep under set transformer limits/renewable energy limits
- Agents given
 - Current load/
current price only
 - Predicted load/
predicted price too
 - Current levels of wind



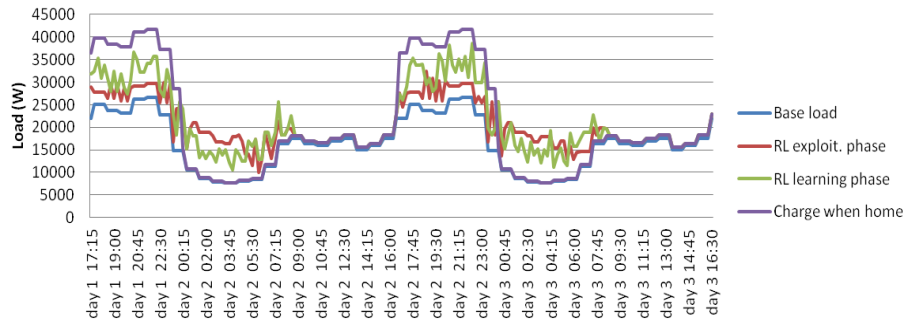
Decentralised: Multi-agent residential demand side management based on load forecasting

- Uses reinforcement learning
- Distributed W-Learning (DWL)
 - Multiple policies on each agents
 - Multiple agents collaborating
 - Learn dependencies between neighbouring agents
- Each agent learns how its actions affect its neighbours

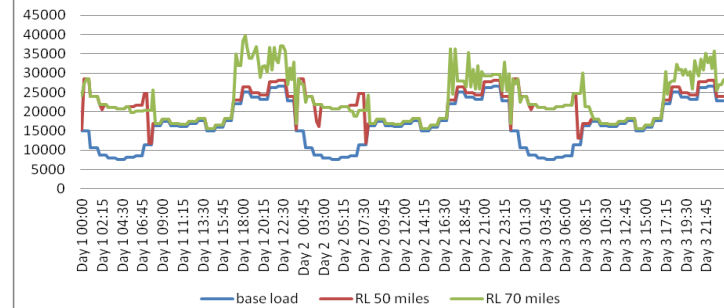


Decentralised: Multi-agent residential demand side management based on load forecasting

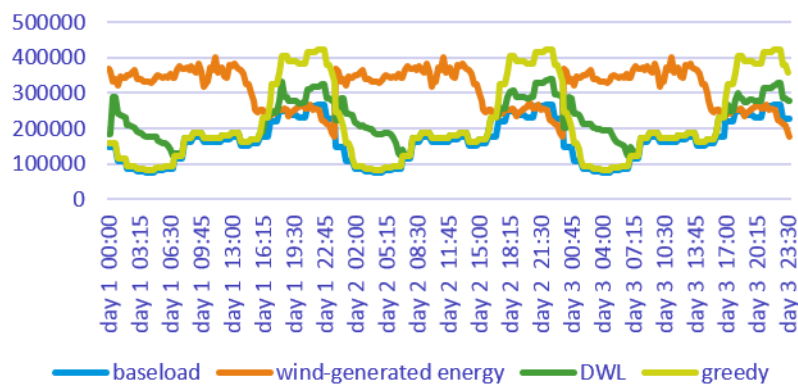
Demand response based on current load - 9 EVs



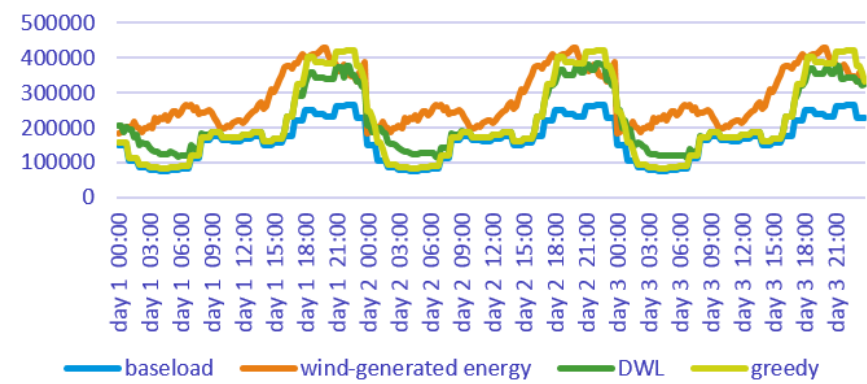
Demand response using current and predicted load - 9 EVs



90 EVs - wind generation low at peak time



90 EVs - wind generation high at peak-time



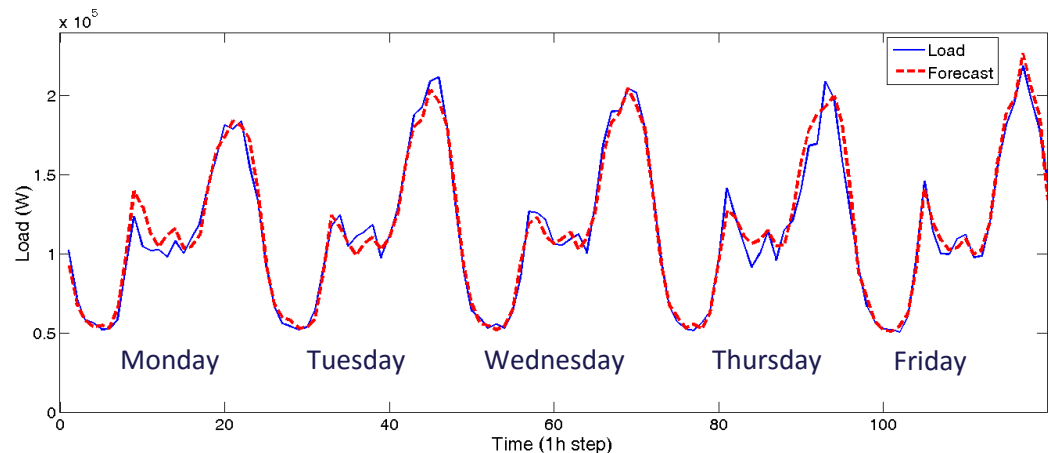
Decentralised: Enhancements to demand side management in residential communities – load forecasting



- Short term load forecasting:
 - Estimate a residential community's power demand ahead of time (day ahead, week ahead) based on historical load and weather information
 - Tackle issues of small scale (i.e., unpredictable human factor)
 - Detect anomalous changes from expected demand; match anomalies with previously encountered information and attempt re-prediction
- Target: Avoid high peak usage of electric appliances

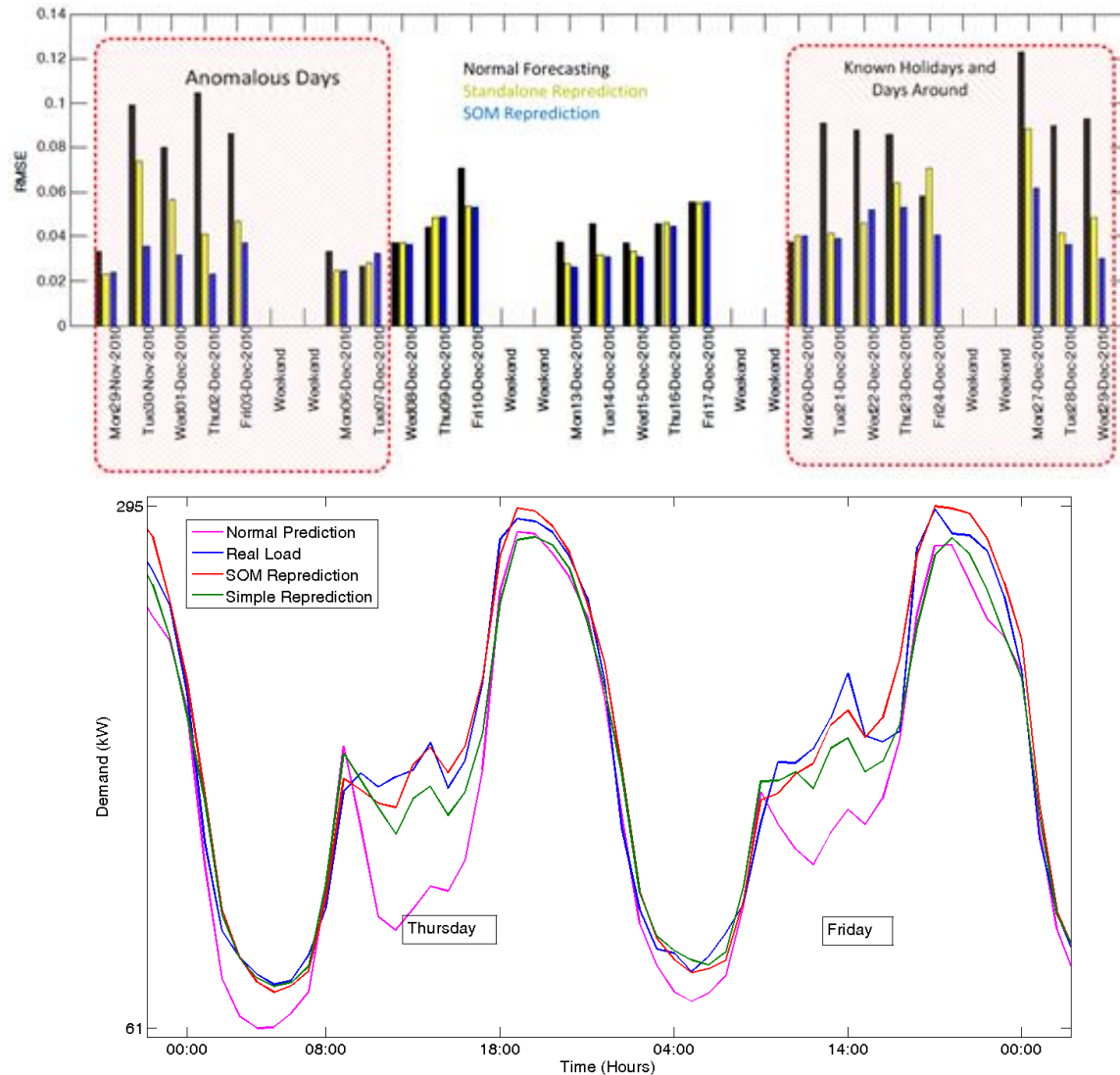
Decentralised: Enhancements to demand side management in residential communities – load forecasting

- Normal days prediction:
 - Combines several techniques with various advantages (ANN, WNN, ARIMA, NF)
 - Focus on a community of 230 houses (half-hourly recorded demand from the CER smart-meter trial)
 - Uses historical weather information from Dublin airport station
 - Achieves 2.39% NRMSE (evaluation over 20 consec. days)



Decentralised: Enhancements to demand side management in residential communities – load forecasting

- Anomalous days prediction:
 - Detects anomalous pattern changes in day demand as it progresses
 - Matches anomaly type from previously classified days and triggers re-prediction based on them
 - 3.63% prediction error, 65% detection rate at 2:30pm



Conclusions *(energy)*

- The rise in the use of electricity for heating and electric vehicle charging, combined with inherent instability in the availability of renewable energy presents new challenges for energy demand management
- As with mobility, new technologies can be exploited to mitigate this, by providing personalised information & feedback
- Even at residential level, individual needs can be met, with worthwhile aggregated savings



Coláiste na Tríonóide, Baile Átha Cliath
Trinity College Dublin

Ollscoil Átha Cliath | The University of Dublin



Thank you.

Prof. Siobhán Clarke

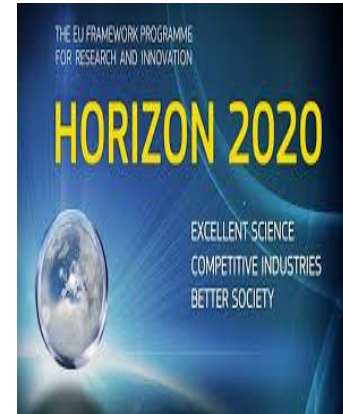
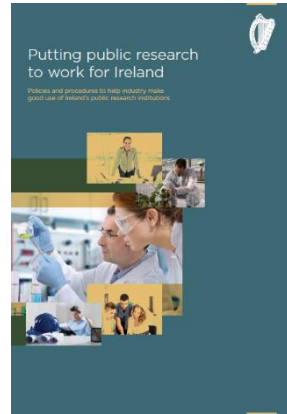
**Director, Future Cities. The Trinity Centre for Smart and Sustainable Cities
Trinity College Dublin**

Siobhan.Clarke@scss.tcd.ie

www.tcd.ie/FutureCities/



Key Irish Government/SFI Drivers



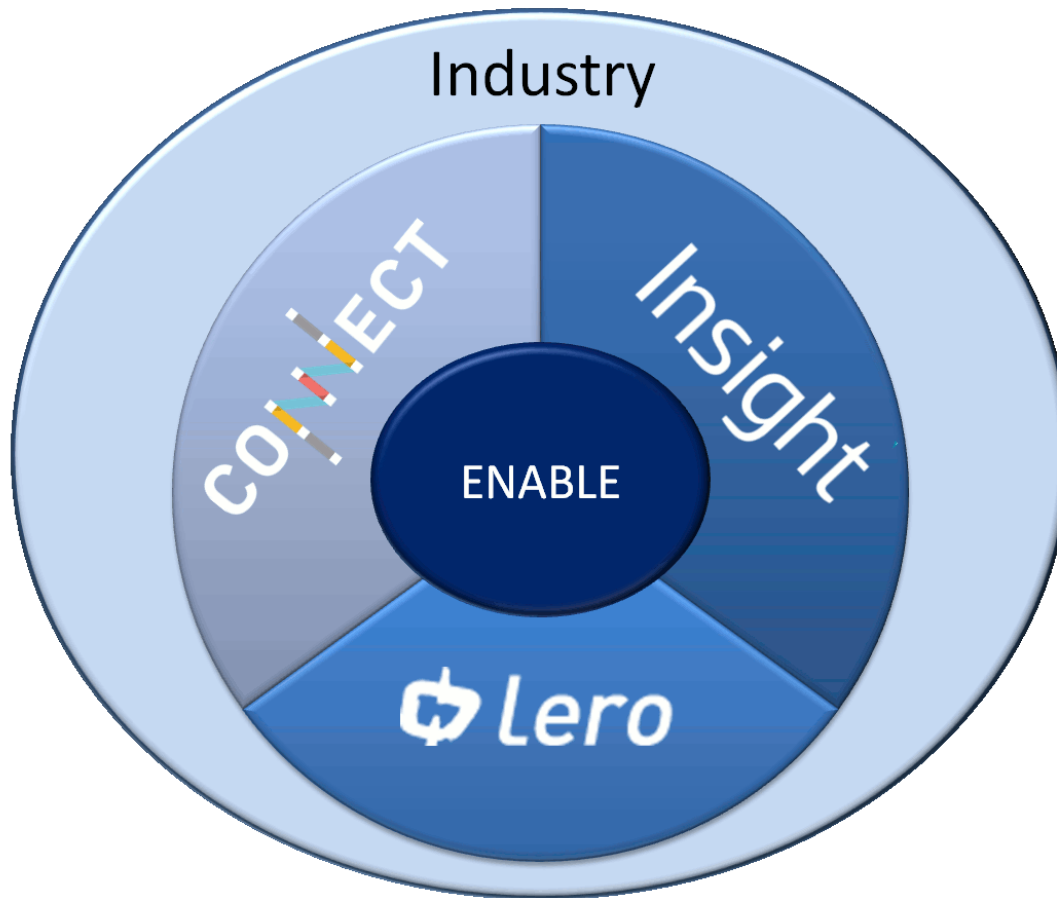
*Irish Government investment through its new science strategy Innovation 2020 – **is set to increase from 1.6% to 2.5% GDP by 2020** and where there is increased emphasis on delivering impact from our research.*

ENABLE:
**Connecting communities to smart
urban environments through the
Internet of Things**

SFI Spoke Project
Connect, Insight, Lero

Director: Prof. Siobhán Clarke, TCD

Spoke Overview



ENABLE: *Connecting communities to smart urban environments through the Internet of Things*

Large Scale Spoke Award, integrated into established SFI Centers & RPO Research Leaders

Linking new and existing industry partners to address challenges



Siobhan Clarke TCD



Dirk Pesch CIT



Ken Brown UCC



Barry O'Sullivan UCC



Deitrich Rebholz NUIG



Doug Leith TCD

Rapid Prototyping and Experimentation

Insight

Patterns-based reasoning

Statistics-based reasoning

In-networks reasoning

Cloud technologies

Linked Data / Semantics

Lero

Privacy, forensics, compliance

Sec. and Human Behavior

Adaptive Software Systems

CONNECT

Wireless, Mobile networks

Network Performance

Network Protocols

Network Architecture

ENABLE

Range of Expertise

Data analytics for mobility and ITS

Socio-Technical Co-Design

Ethical, Legal, Security studies

Social Urban Planning

Spatial Data Science

IoT Business Models

IoT Governance, Risk Models

Autonomous actuating services

Urban-scale service resilience

Urban-scale security and privacy

Connected world exploitation

Resource efficiency

Locating functions

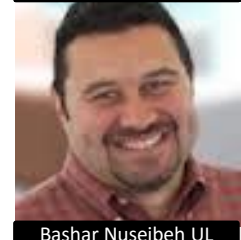
Privacy

Scalable optimization

Analytics for wireless networks



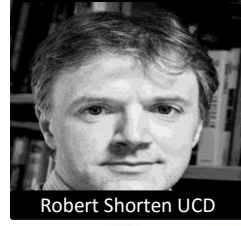
Cormac Sreenan UCC



Bashar Nuseibeh UL



Anna Davies TCD



Robert Shorten UCD



Brian Donnellan NUIM



Noel O'Connor, DCU

ENABLE's focus areas

Research Excellence

Citizen
Engagement

Feedback and
Actuation

Connected
Decisions

Security and
Privacy

Applications

Urban Test Beds

Smart Buildings



Smart Stadiums



Smart Towns



Smart Cities



Data Sources

Pervasive Nation



ENABLE's Conceptual Framework



Supporting Cultures
of Participation

Stakeholders



HUAWEI



ZURICH



Co-Design: Citizen & City Planners



Cork City
Council

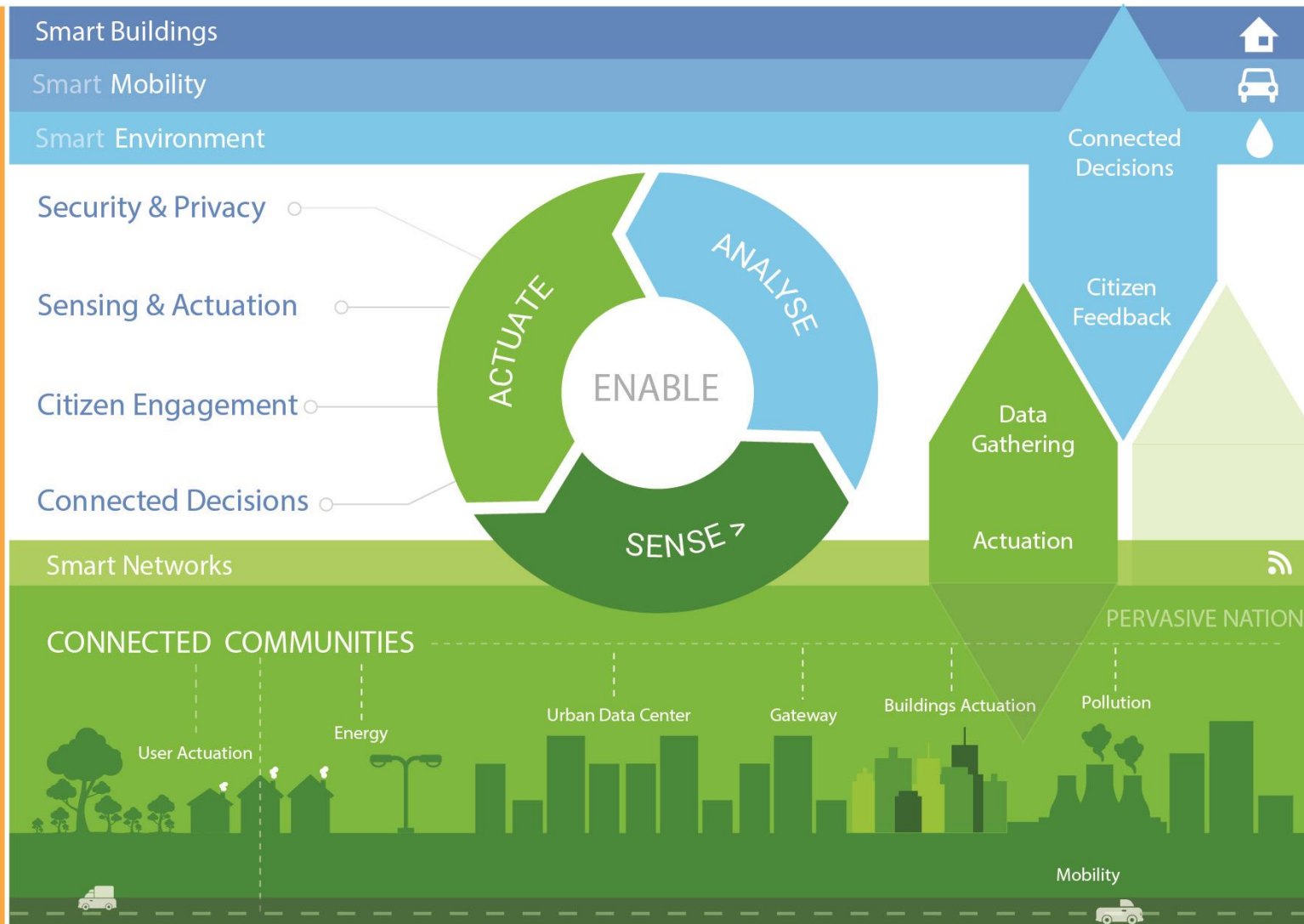


Cork County
Council



Dublin City Council

Comhairle Cathrach Bhaile Átha Cliath



The Value of Engaging for Industry

- Partnership in **world class smart Cities research** capability focusing on your challenges
- State of the art **nationally funded infrastructure** to support an ecosystem of public partnerships and an innovation ecosystem
- **Significant Leveraged research funding** – helps to de-risk projects by sharing the costs and allow future planning.
- Ecosystem & Environment to **network and influence** with other companies and public light house projects .
- **European Connectivity** – Horizon 2020 networks, OASC networks, Policy networks (ex BDVA), etc .
- **Graduate & PhD Employment/Talent** – evaluate future employees.
- Access to **intellectual property** – strengthen your IP position.



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Trinity College Dublin

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Thank you.

Prof. Siobhán Clarke

**Director, Future Cities. The Trinity Centre for Smart and Sustainable Cities
Trinity College Dublin**

Siobhan.Clarke@scss.tcd.ie

www.tcd.ie/FutureCities/





Community-based Approaches to Looking after Older People in Tokyo

**Eco-Urbanites: International Multidisciplinary Symposium
in Comparative Urban Studies at Trinity College Dublin**

26-28 January 2017

**SCHOOL OF SOCIAL POLICY, SOCIAL WORK AND SOCIAL JUSTICE
UNIVERSITY COLLEGE DUBLIN**

HOKKAIDO UNIVERSITY PUBLIC POLICY SCHOOL & POLICY ALTERNATIVES RESEARCH INSTITUTE, UNIVERSITY OF TOKYO

NAONORI KODATE



The ageing care crisis in Japan: Is there a role for robotics-based



ISCA Japan
International
Strategic
Cooperation
Award



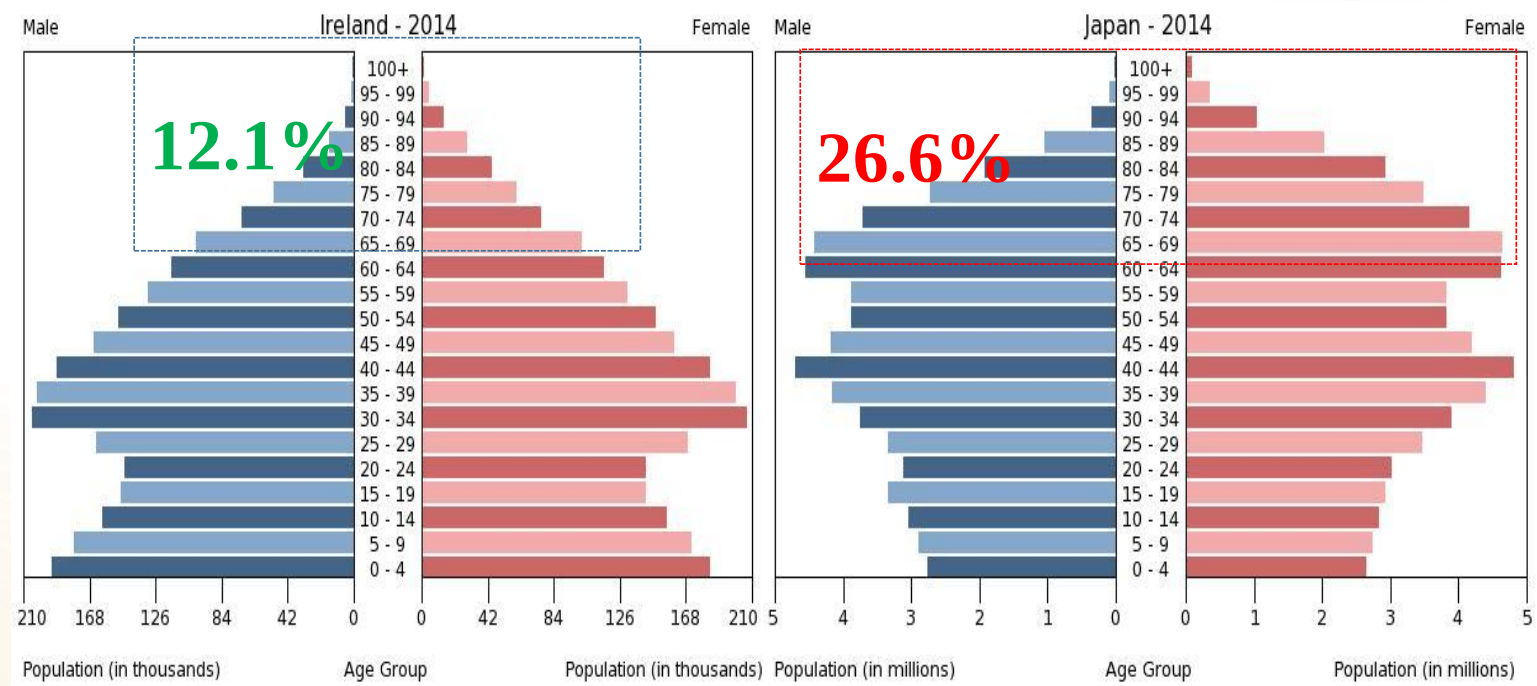
My Talk

- Background
- Super ageing society and policy in Japan
- Tokyo's approach(es) to becoming an inclusive, age-friendly city



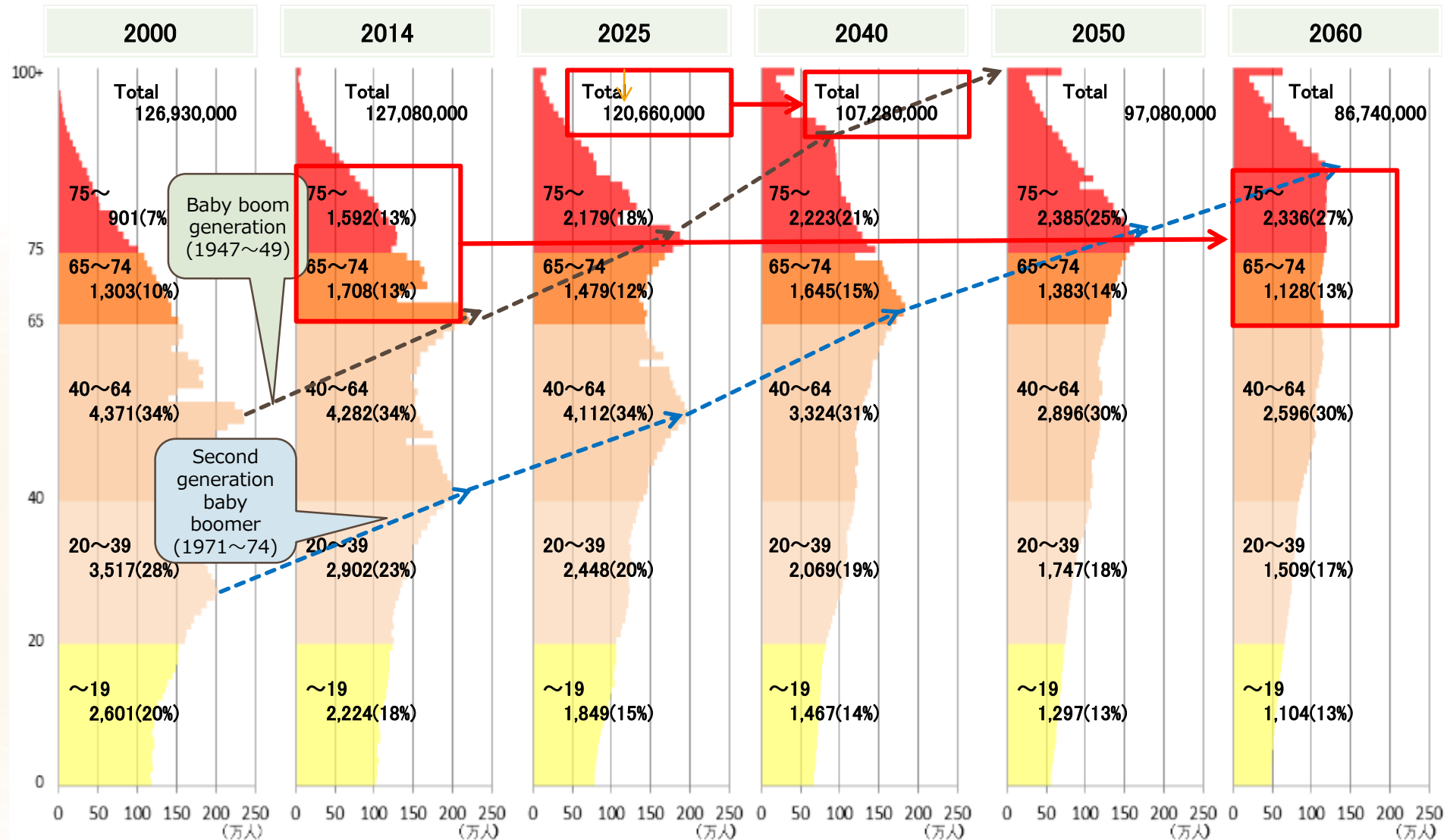
What policies and structures are in place, and who are the key actors?

Ireland & Japan: different demographics



	Ireland	Japan
Median age (2013)	35.7	46.1
Life expectancy (2013)	80.9 (F:83.2/M:78.7)	84.2 (F:87.7/M:80.9)
Birth rate (2014 est.) (births/1,000 population)	15.18	8.07
Total fertility rate (2013) (children born/woman)	2.01	1.39

Declining population & super ageing society



(Source: Census 2012, Japanese Ministry of Internal Affairs and Communications. By courtesy of Prof. Yu and his team at Chiba University)

Pressures for change and policy response

- ▶ Rapidly ageing society (demographic structure change)
 - Very high life expectancy
 - Declining (and low) birthrate
- ▶ The nuclearisation of the family
- ▶ Increasing participation of women in the labour market
- ▶ Heavier burden that a family care-giver was forced to bear
- ▶ Socialisation of long-stay in hospitals

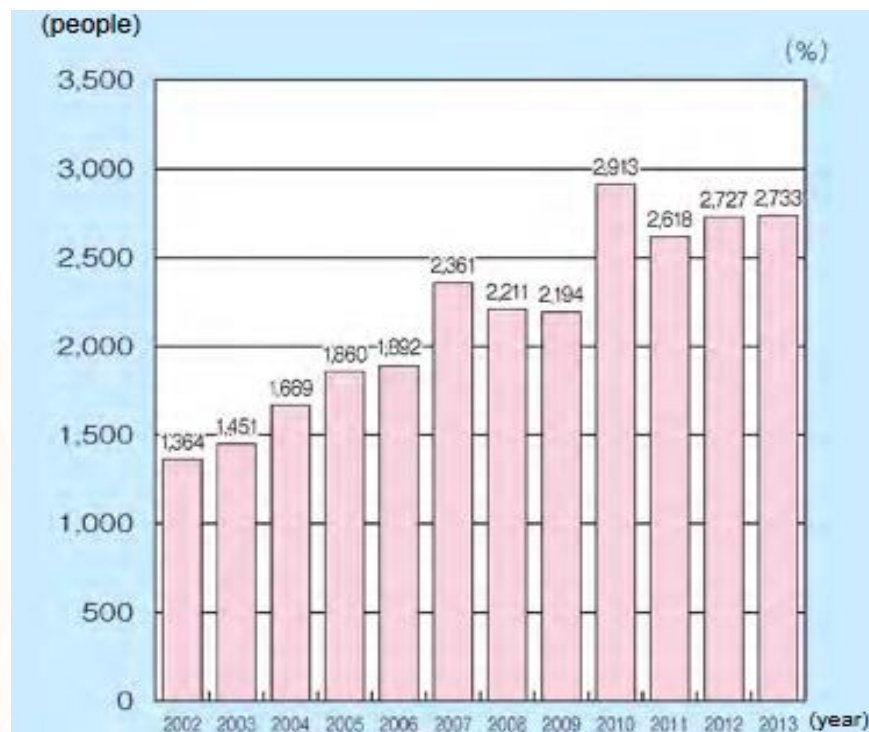
(Source: Japanese Ministry of Health, Labour and Welfare, 2013. By courtesy of Prof. Yu and his team at Chiba University)

Super ageing society in Japan

- Medical expenditure is increasing
 - Ageing is one major factor for increasing medical care costs.
- Population of lonely living elderly is increasing
 - There is a great need for “ageing in place”
- The gap between populated and depopulated areas is widening
 - More people are moving into three major urban areas (Tokyo*, Osaka and Nagoya) (*: Greater Tokyo including Kanagawa, Chiba, Saitama. +68,917, 2015)

Older people and solitary death

People living alone (aged 65 and over) who died at home in Tokyo's 23 Wards



Source: Medical Examiner's Office, Bureau Social Welfare and Public Health "Trends of the number of people living alone who died at home in Tokyo 23 wards"

(Note) 2013 figures are preliminary figures

Breda O'Brien: The world must tackle the epidemic of loneliness

Although the deaths of the McCarthy brothers in their home raise important questions, loneliness in general is on the rise in the western world

🕒 Sun, Oct 9, 2016, 06:00



Breda O'Brien

💬 12

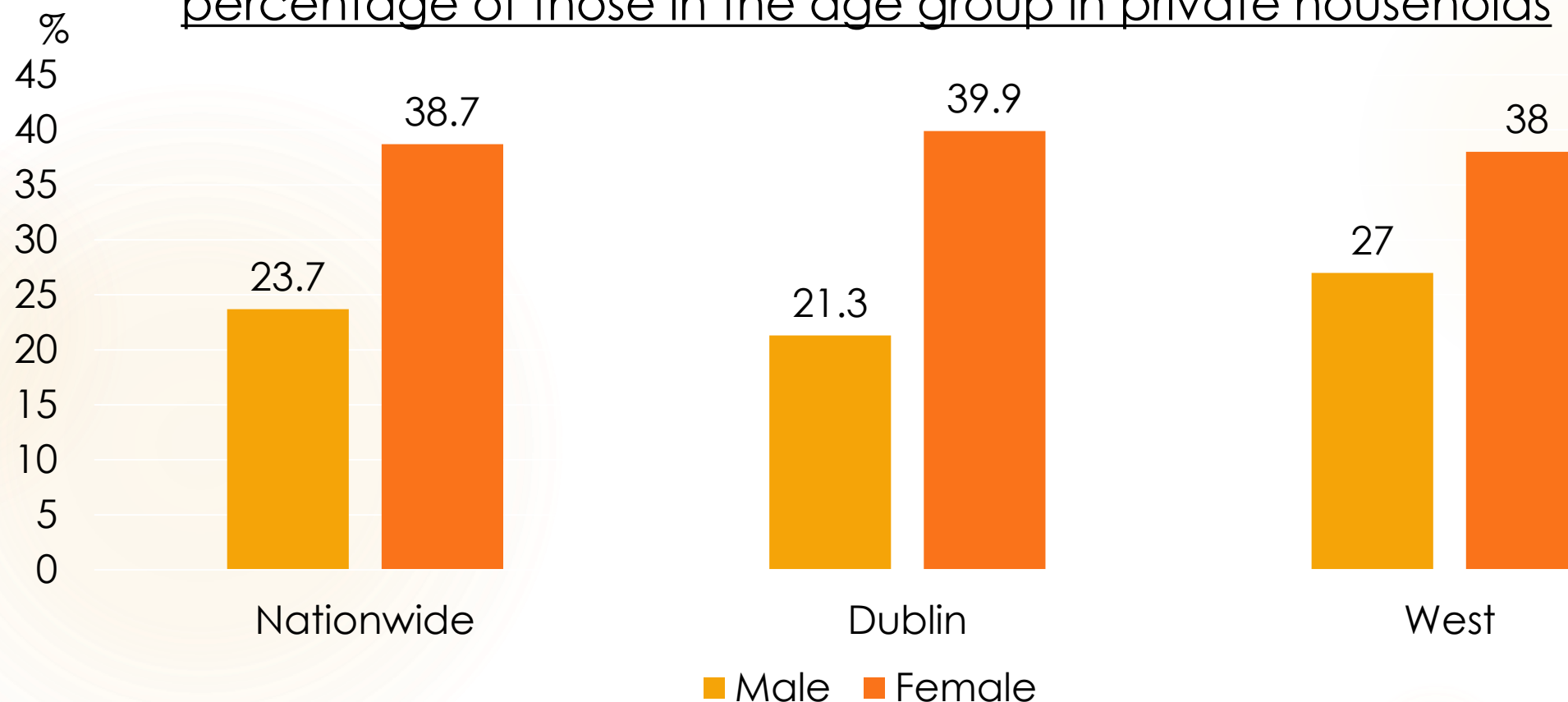
“ (...) In Japan, deaths of the elderly who live alone and who are not discovered for long periods have become almost commonplace. There is a term to describe it: kodokushi – the lonely deaths.”

“ (...) While Japan's culture has arisen from very particular circumstances, there are trends there that should worry all western societies.”

“ (...) The Irish deaf community has pushed hard for the provision of more services, including support for those living alone.”

Older people's households (What about the situation in Ireland?)

Persons aged 70 years and over and living alone as a percentage of those in the age group in private households



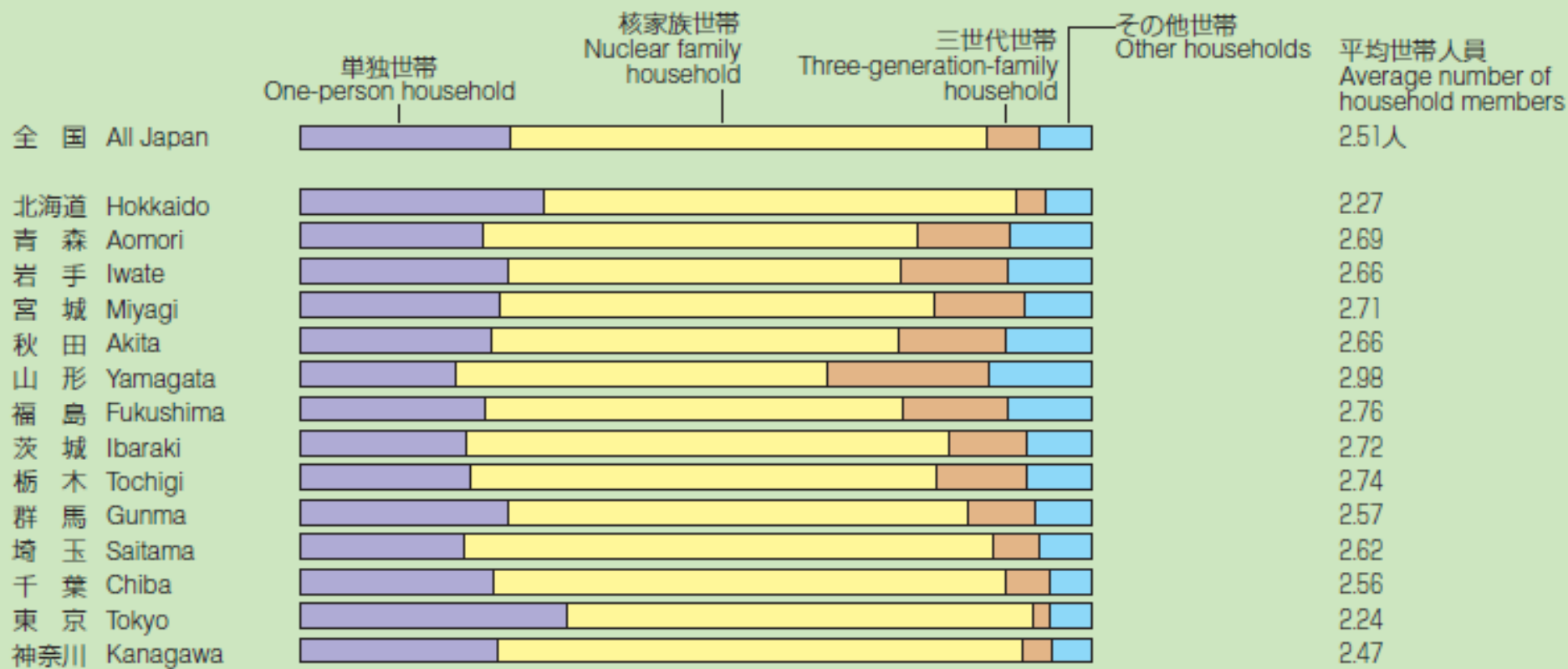
(Source: Central Statistics Office, Census 2011. Author adapted.)

Tokyo

- ▶ In 2016, the population of older people in Tokyo surpassed 3 million for the first time.
- ▶ The proportion of one-person households is the highest in Japan.

都道府県別にみた世帯構造別世帯数の構成割合及び平均世帯人員

Percent distribution of households by structure of household and average number of household members, by prefecture



Tokyo

- ▶ In 2016, the population of older people in Tokyo surpassed 3 million for the first time.
- ▶ The proportion of one-person households is the highest in Japan.

Can Tokyoites
become Eco-Urbanites??



Local Autonomy & decentralisation in Japan

- ▶ The Local Autonomy Law (Constitution of Japan, 1946) establishes two tiers within the local government – the prefecture and the municipality.
- ▶ Municipalities are charged with providing basic services and infrastructure to the community such as town planning and community roads.
- ▶ Decentralisation in Japan has been promoted since the 1990s in order to promote community participation in planning and decision –making (Ohsugi, 2007).
- ▶ In Tokyo, there are 23 special wards, 26 cities, 1 district and 4 sub-prefectures.

Musashino City



Ōta Ward

Two municipalities in Tokyo

	Ōta Ward	Musashino City
Population (Tokyo: 13,636,222 prs)	716,413 (non-Japanese: 18,545)	143,868 (non-Japanese: 2,835)
Area (Tokyo: 2,190.93 km ²)	59.46 km ² (largest of 23 special wards)	10.98 km ²
Population density (Tokyo: 6,223.94 prs per km ²)	12,048.65 persons per km ²	13,090 persons per km ² (largest in Tokyo)
Ratio of daytime population to nighttime pop. (=100)	98.7	110.5
Ratio of those aged 65 yrs old and over (Tokyo: 23.1%)	22.7% (2013)	22.0% (2014)



http://www.sangyo-rodo.metro.tokyo.jp/toukei/pdf/pdf/ch01/1_02.pdf

<http://www.toukei.metro.tokyo.jp/tyukanj/2010/tj-10index.htm>

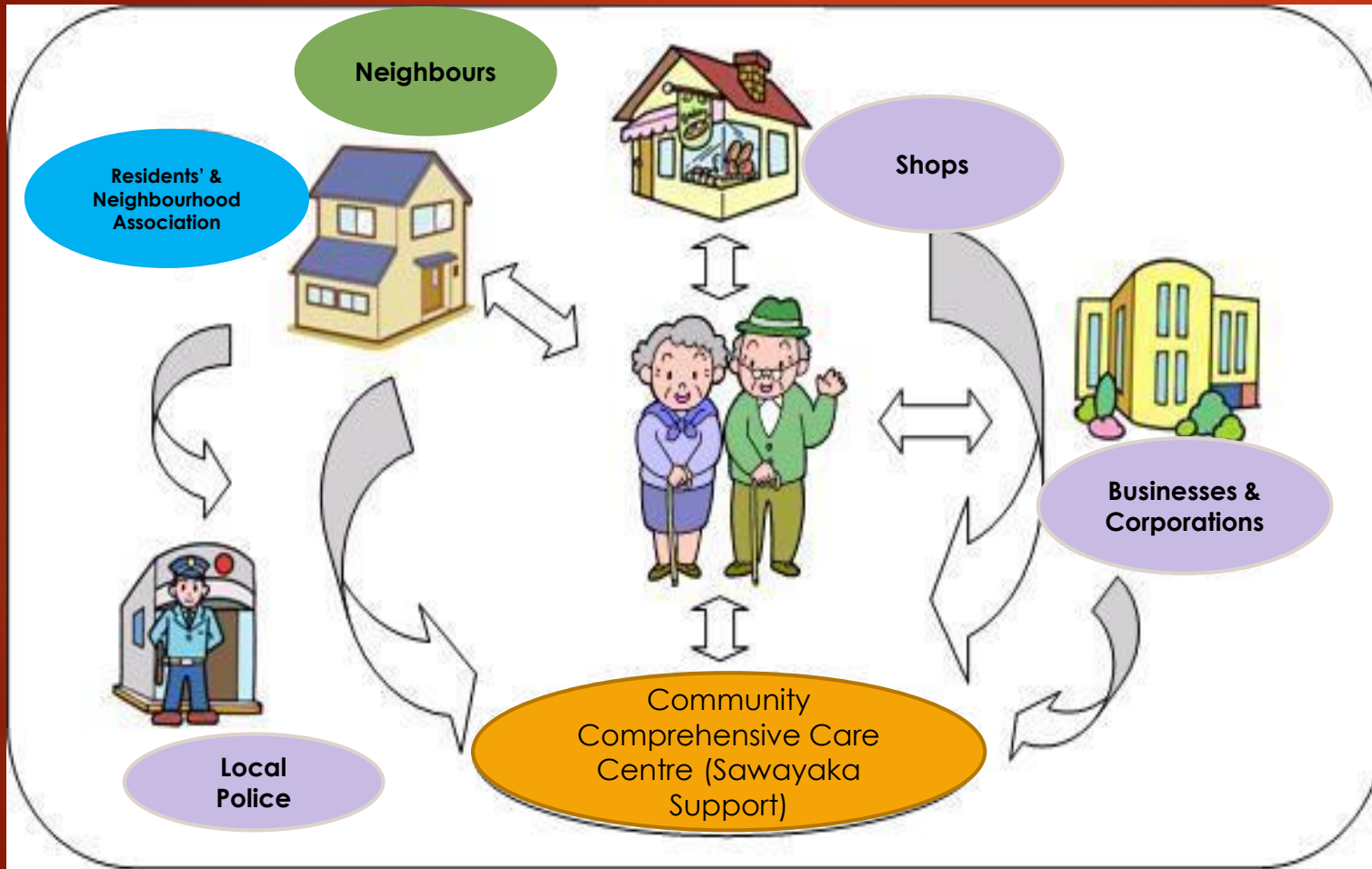
Social care policy in Tokyo

- ▶ December 2007: Tokyo Metropolitan Government's 10-year Strategy Plan ('Tokyo Community Care Initiative') published.
...Vision for 2017...
 - Older people will be able to choose their own places to live.
 - Integrated care system will be established to support older people living in their own (private) homes with personalised care and services.
 - Older people will not only be care-recipients but also active care-givers (active participants in society).
 - Preventive measures for dementia will be in place, and public health will be more widely promoted.

Other policies for older people in Tokyo

- ▶ Housing: e.g. Silver-Peer (Housing complex for singles or couple households for those 65 years old and over. Eligibility: living in Tokyo for over 3 years, income upper limit, etc.) since 1987
- ▶ Transport: Silver-Pass (*JapanRail – 30% deductions by paying an annual fee of JPY3,770. Eligibility: 65 yo and over for men, or 60 yo and over for women).
- ▶ Tokyo Metropolitan Institute of Gerontology (TMIG) established in 1972
- ▶ Others include guidelines and manuals regarding counter-measures against disaster, etc.

Ōta Ward



Mimamori as a concept

The concept has three main attributes:

- (1) "keeping some distance by paying due considerations to the feelings and circumstances of each person,"
- (2) "checking the safety of elderly people by observation and/or measurement," and
- (3) "understanding the needs of older people through collaboration with local residents and organisations in the community."

<http://www.city.ota.tokyo.jp/seikatsu/fukushi/kourei/mimamorinettowaku.html>

Kanzaki, Y. (2013) Concept Analysis of "Mimamori" for Community-Dwelling Elderly People. *Japan Academy of Nursing Science*, 33(1), 134-141.

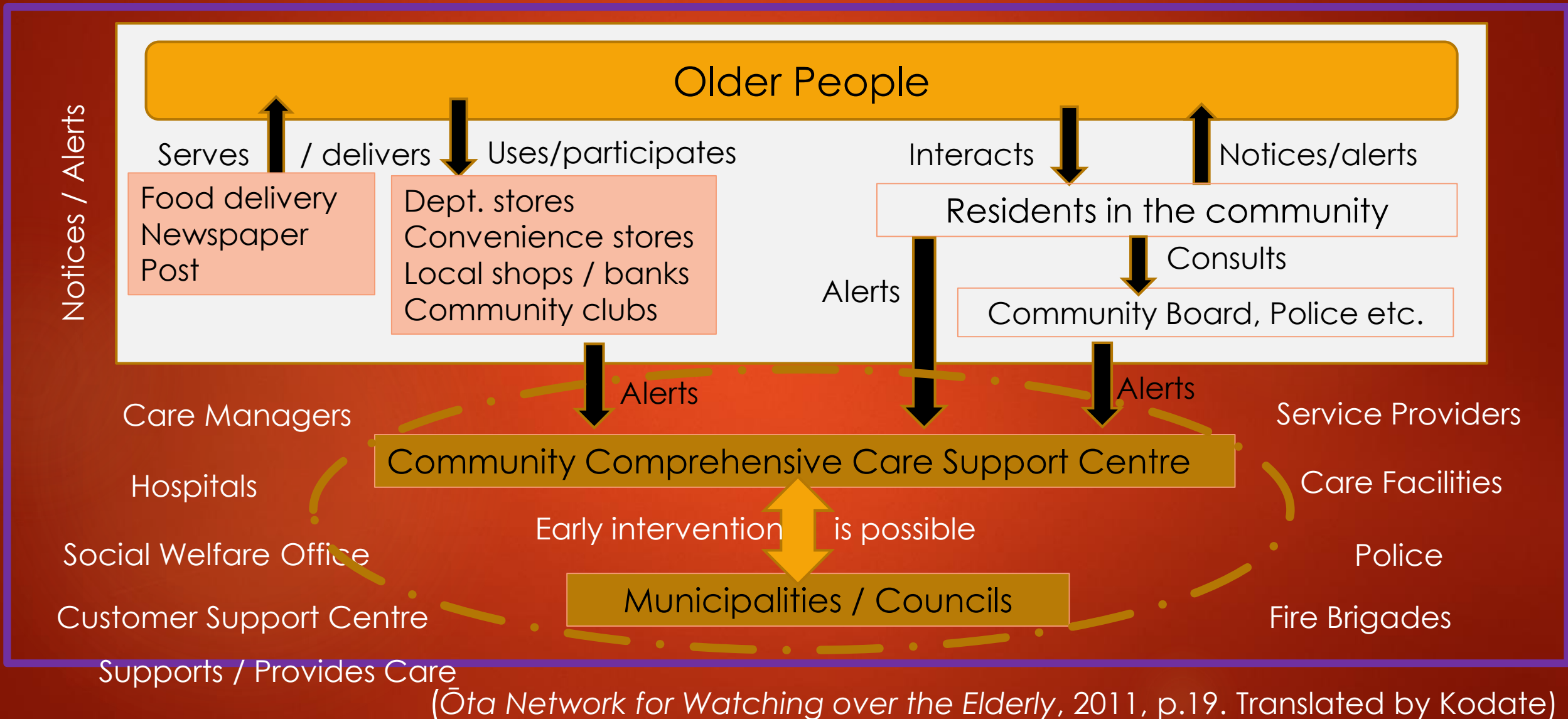


NEWS / ニュース

2016.6.19 高齢者に優しいまちへ 富山大附属病院など富山で担い手養成講座

一覧をみる >>

Conceptual map: Mimamori Network



Mimāmo

(Ōta Network for Watching over the Elderly)

Established in 2008 by twelve care professionals and three staff members of Daishin Department Store

Main players

- ▶ Social workers and nurses in Community Comprehensive Care Centres (CCCCs), hospitals, clinics and social work offices for audit guardians
- ▶ Four areas in Ōta Ward
- ▶ Local shops and businesses



SOS key holder system for the elderly



The concept has now been adopted by Shibuya Ward (Tokyo), Kishiwada City (Osaka), Kagoshima City, etc.
(By courtesy of Prof. Yamanoi)

Community salon in shopping district “Mimāmo Station”



<http://mima-mo.net/activity/akinai/>
(By courtesy of Prof. Yamanoi)

Welcome



Musashino
city

http://www.mofa.go.jp/j_info/japan/socsec/maruo/maruo_10.html

Musashino City

Pro-welfare, livable town

Musashino is known as a pioneer city for its personal social services for the elderly, a unique reverse mortgage system and paid volunteer system.

- ▶ Musashino Welfare Corp. was founded in 1981 and the Corporation introduced a welfare financing system on mortgage (house) for the elderly (the first of its kind in Japan).
* Reverse mortgages for elderly homeowners who have substantial equity in their homes but with no sufficient cash flow.
- ▶ A paid volunteer system to supplement public home-help services was also introduced.
- ▶ An emergency information system for the elderly supported by neighbours was established in 1982.

Musashino City

- ▶ The philosophy of “active and high-quality life for all” has prompted Musashino City to introduce a variety of welfare programmes.
- ▶ Based on the above motto, Musashino City has been promoting reform of the city so that the elderly and the disabled can enjoy a normal urban life. Enhanced mobility is also seen as a vital part of its policy (e.g. “Mu-Bus” (moves))

Musashino City

- ▶ Municipal Ordinance for Welfare of the Elderly, enacted in April 2000
- ▶ Tried to cover the “gaps” created by the Long-term Care Insurance Policy.
 - “Self-help”, “mutual assistance” and “public support”
 - Proportion of older people living alone is relatively high in Tokyo

Musashino Model

Housing

Employment

Public Health/
Healthcare

Ordinance regarding the Provision of Comprehensive Welfare for Older People (2000)

[Support for housing]
e.g. Reverse mortgage, Silver-Peer

e.g. Silver Citizens Work Placement Centre

[Promotion of Active Ageing]

[Care-related Facilities]
e.g. Ten Million House
Dementia Care Support

Ordinance regarding the Use of Welfare Services by Older People (2015)

e.g. Health promotion
Daily exercises

[Public Transport]
e.g. Mu-Bus
Lemon Cab

Long-term Care Insurance Ordinance (2000)

[Statutory Benefits/Service Provision]

e.g. Day Service
Home Help
Short Stay
Special Old People's Homes

[Welfare Facilities]

[Protection of Service Users]

[Provision of Care Facilities]

Lifelong
learning, etc.

Transport /
access.

MūBus & Lemon Cab

- Designed to enable elderly people to take part in daily activities and lead an active social life.



Ten Million House

- ▶ Initially began with a house donated by a resident (a couple without children).
- ▶ City Mayor and welfare officers decided to use the house as a community centre for older people. Now seven TM Houses are run by a group of local residents or welfare organisations (chosen through open selection).



Conclusions

- ▶ Community-based approaches to looking after older people in Tokyo have been developed in response to problems that need solving, but proactive measures were also taken to make their own towns livable and inclusive.
- ▶ As a result, different models (initiatives and approaches) can be found across Tokyo, each reflecting its distinct local history and profile (e.g. industry, local politics).
- ▶ To address the same issue of super-ageing society, local solutions were sought depending on who became the main drivers for change, as exemplified by the two cases (Ōta Ward and Musashino City).

Conclusions: different approaches & similar challenges?

Ōta: care professionals & community enterprises (e.g. supermarket, department stores, construction companies) working together

- ▶ Some scholars and professionals are looking at this cautiously as commercial enterprises are profit-driven.

Musashino: city council as guardian and financier

- ▶ Long-term care policy created a buffer between service providers and the city. Who listens to and collects local voices?
- ▶ Sustainability of high-standard, comprehensive model questioned – willingness of residents to pay higher local taxes, retention of care workers and voluntarism.

Thank you very much!

Special thanks to Mr Moriyasu (Musashino City Council), Profs. Yu, Suwa and the team (Chiba University), Prof. Yamanoi (Meisei University) and the organisers, especially Prof. Lorna Carson (TCD).



御清聴どうもありがとうございました
Go raibh míle maith agaibh!



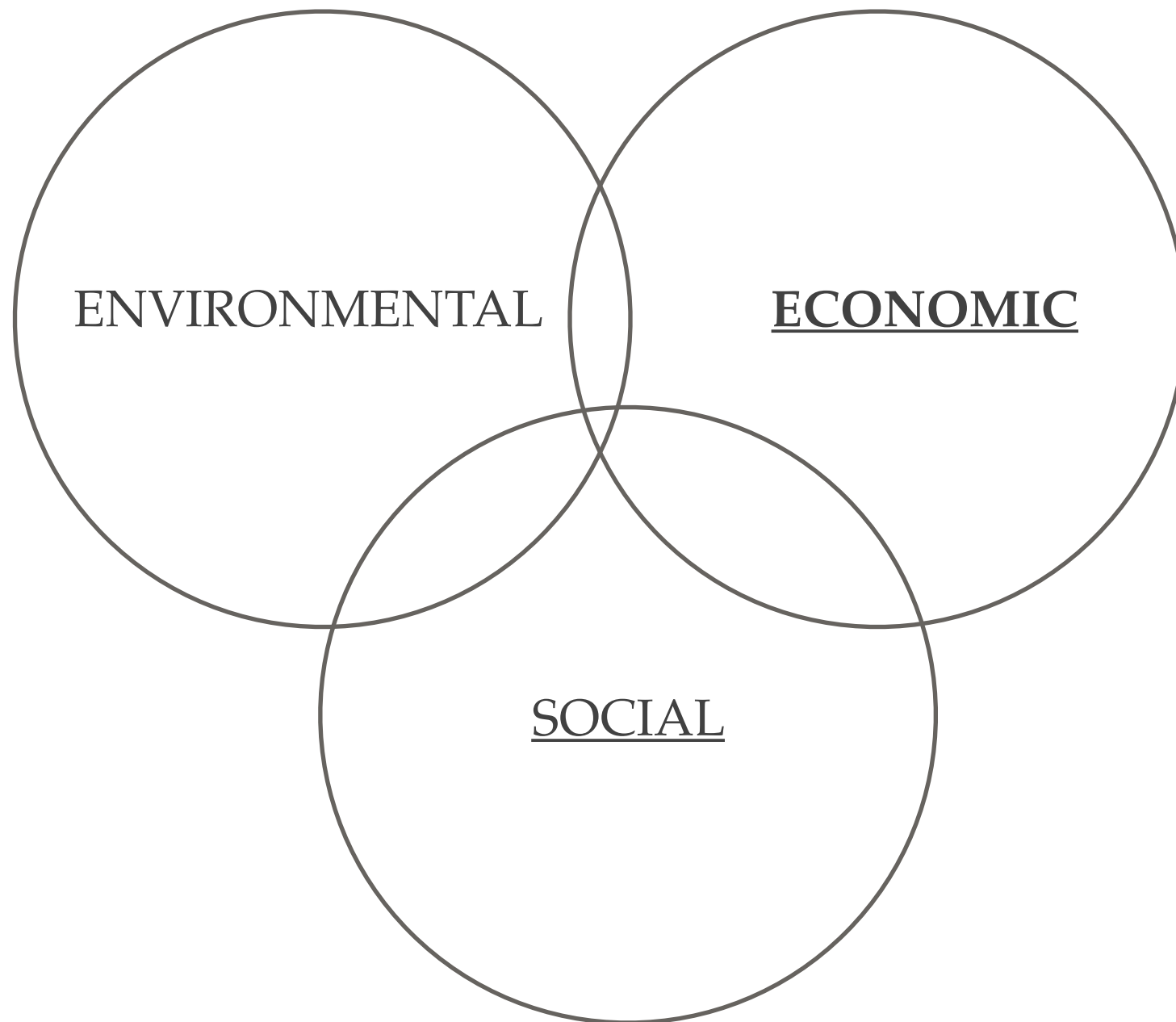


Developments and Prospects for a Sustainable Sector

Urban agriculture in Japan

Dr. James Brady
*Asia Pacific Institute
of Research, Osaka*
27 January 2017

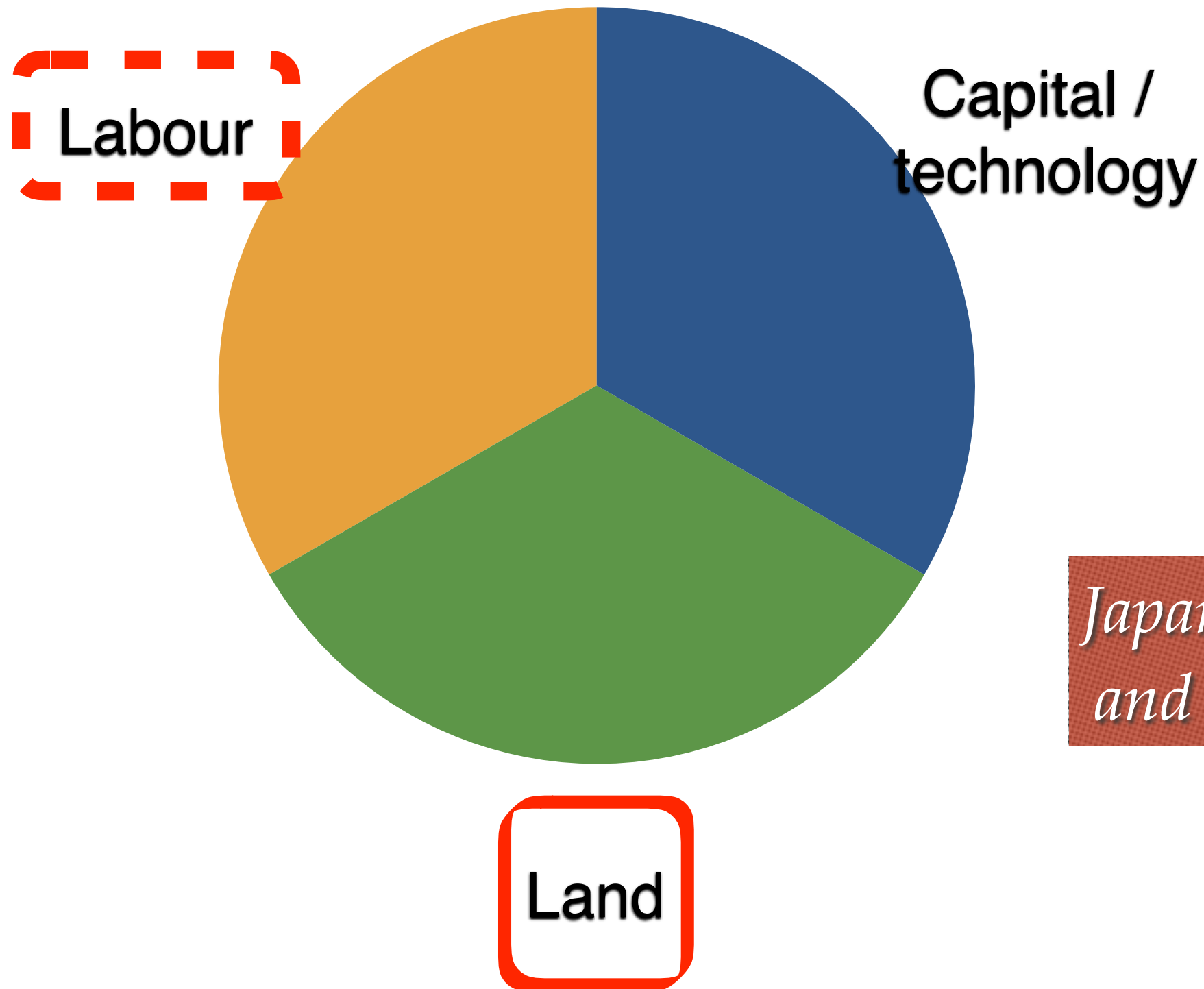
Sustainability



- ❖ ① Background: Japanese agriculture today
- ❖ ② Urban Agriculture in Japan
- ❖ ③ Case studies of urban agriculture in Kansai
- ❖ ④ Is urban agriculture in Japan sustainable?

(1) Background: Japanese Agriculture Today

Factors of production used in agriculture



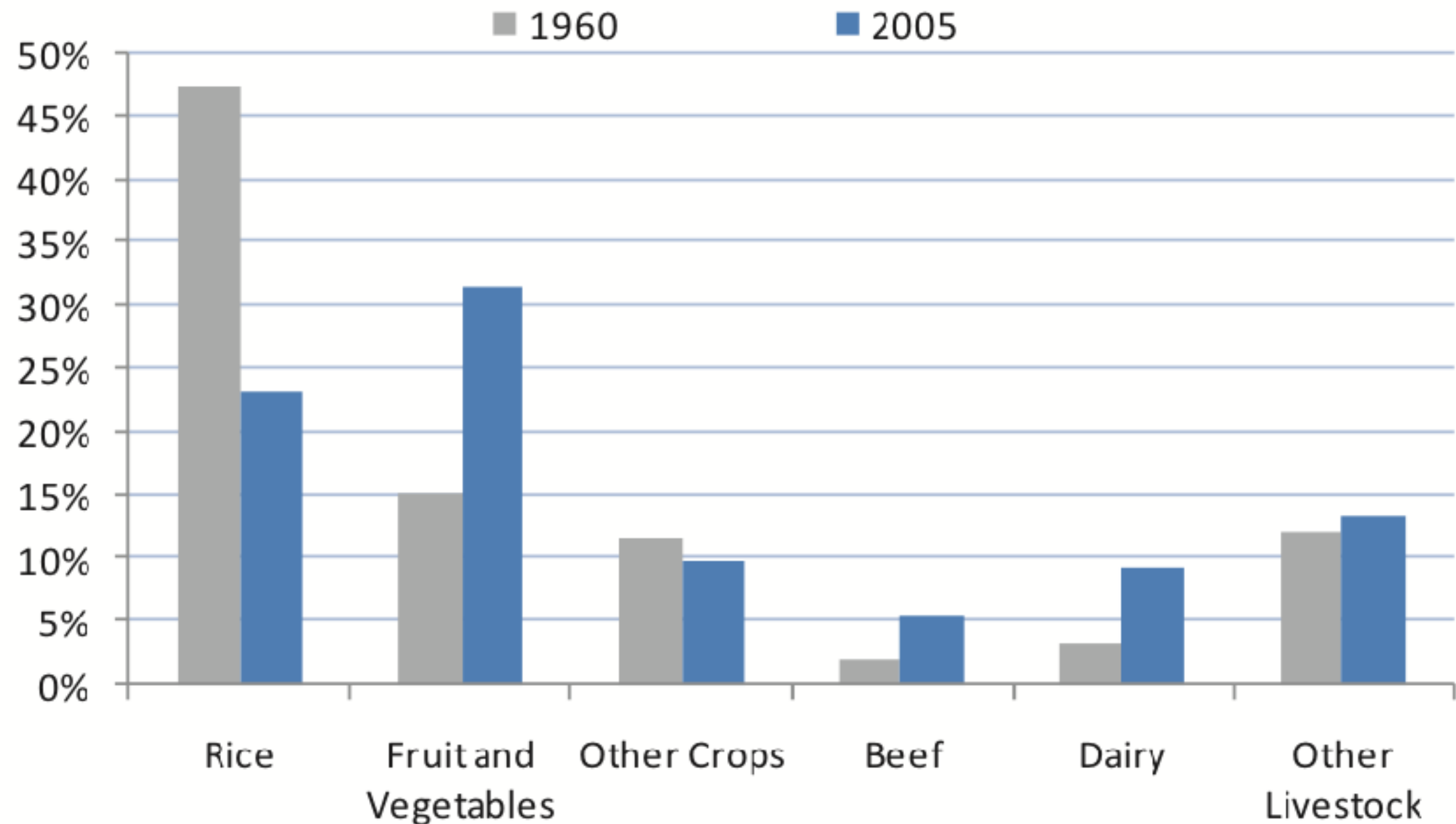
*Japan is scarce in land
and (low-cost) labour*

Farmers

- ❖ Small plots of land (1.3ha), high production costs
- ❖ Many part-time farmers, producing rice on weekends
- ❖ Average age: 66
- ❖ Members of Japan Agriculture 'cooperative'
- ❖ High levels of government support and protection
- ❖ Lack of competition, and competitiveness
- ❖ Ageing population, abandoned land, lack of successors

Agricultural production by value, 1960 and 2005

As per cent of total value of agricultural production



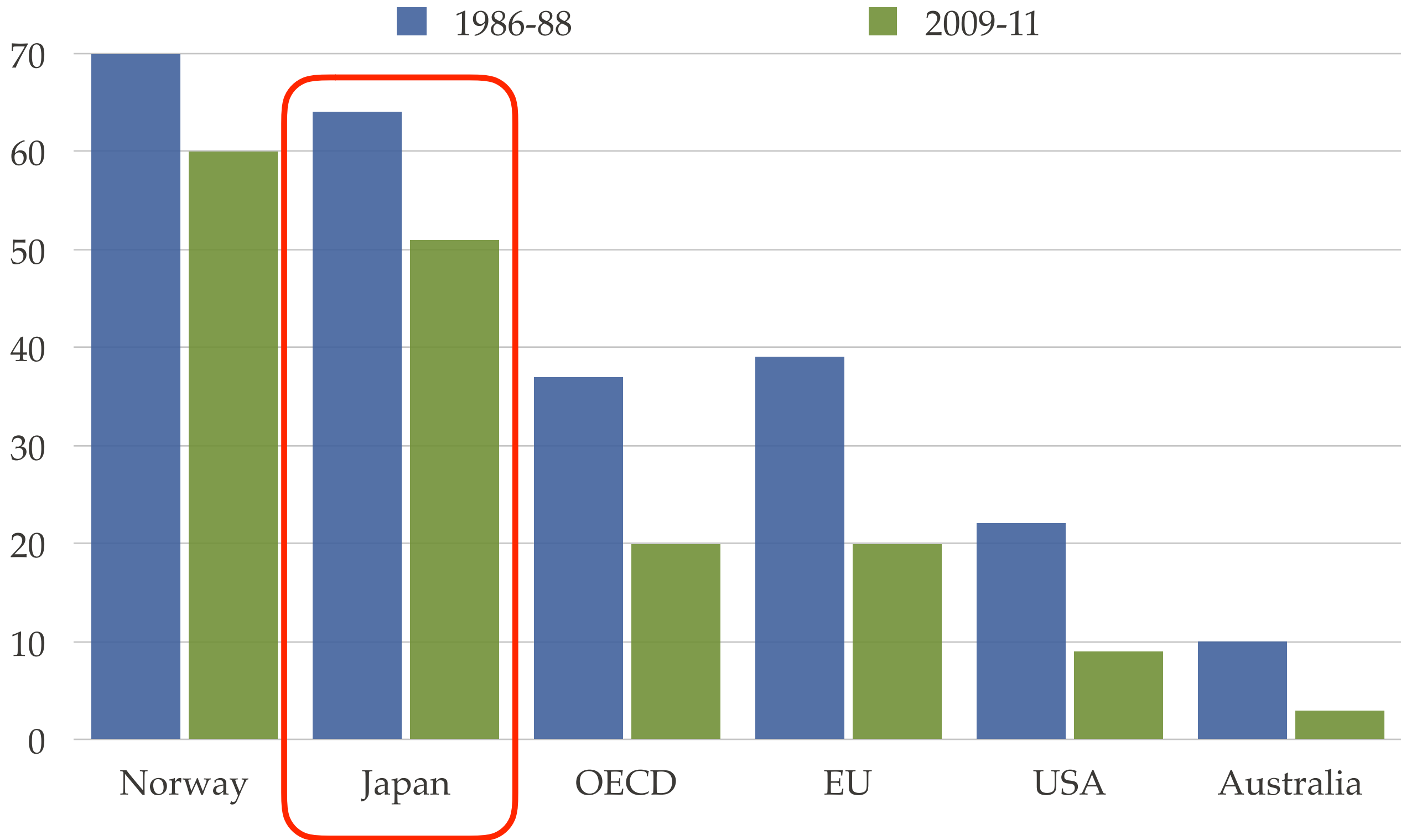
Source: Statistical Annex to the Annual Report on Food, Agriculture and Rural Areas FY2008.

Source: OECD (2012), 'Japanese agricultural reform'

Government

- ❖ LDP historically dependent on **rural constituencies** for votes, and on **JA** for electoral support
- ❖ Policy support through **subsidies** (including *gentan*), **direct income supports**, import **tariffs**
- ❖ Support focused on **rice**, wheat, soybeans, sugar beet etc
- ❖ International trade frictions, esp. since 1980s
- ❖ JA monopoly / monopsony in agriculture after 1950s

OECD Producer Support Estimates



Source: OECD, 2013

Abe Government Policies

- ❖ Phase out *gentan* and income support systems
- ❖ Reform of role of JA , liberalise land sales process
- ❖ Promote greater **corporate** involvement, allow corporate agricultural land ownership
- ❖ Promote agricultural **exports**, and 'sixth sector industrialization'

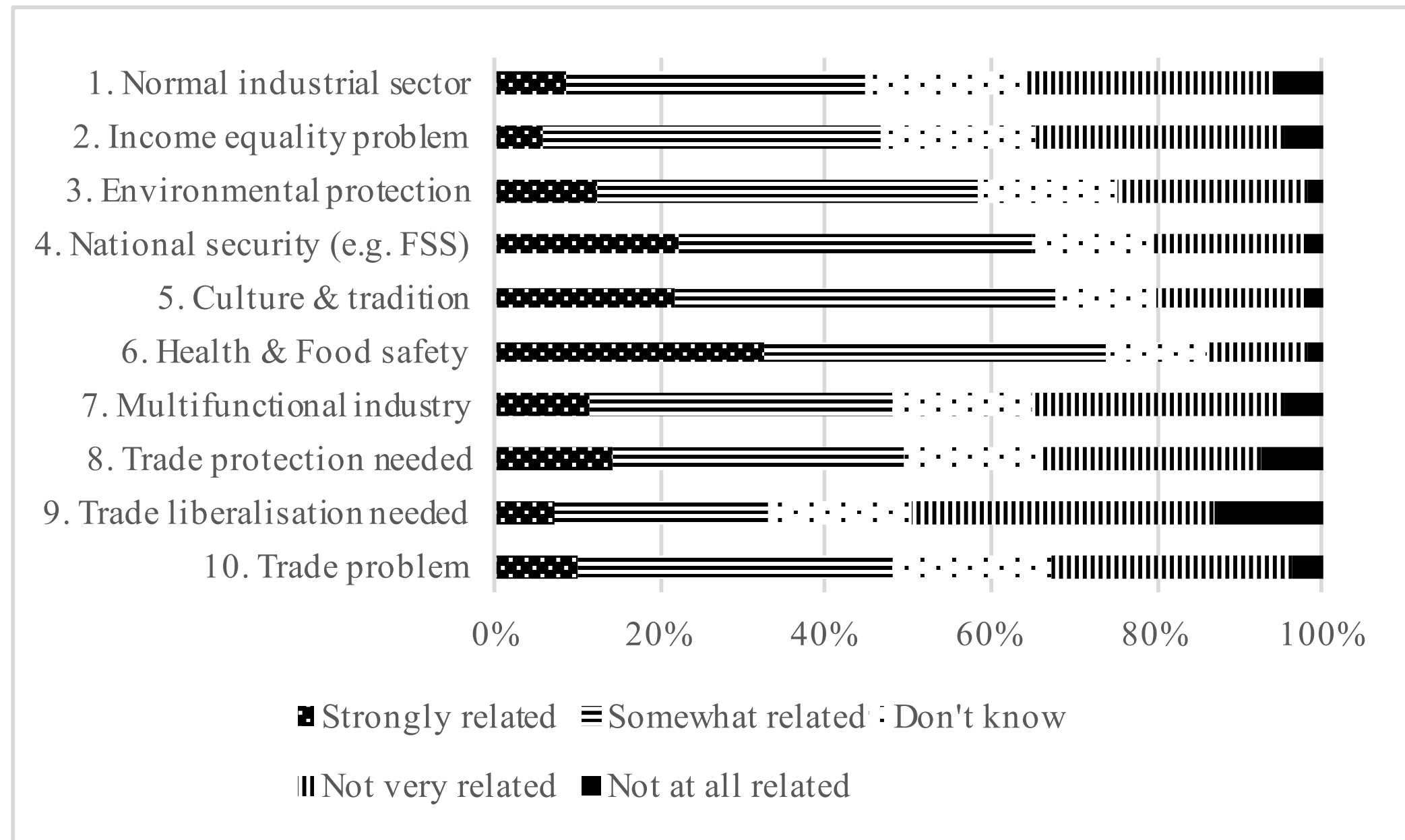
Corporate Agriculture

- ❖ From 1950s: excluded from agr
- ❖ 1999 Agr Basic Law, 2009 Agr Land Law: opened the door to corporate agriculture
- ❖ 2013~: Abe government promotes corporate involvement, e.g. 2014 'Japan Revitalisation Strategy'
- ❖ 2016 Agr Land Law revision: allowed land purchases

Consumers

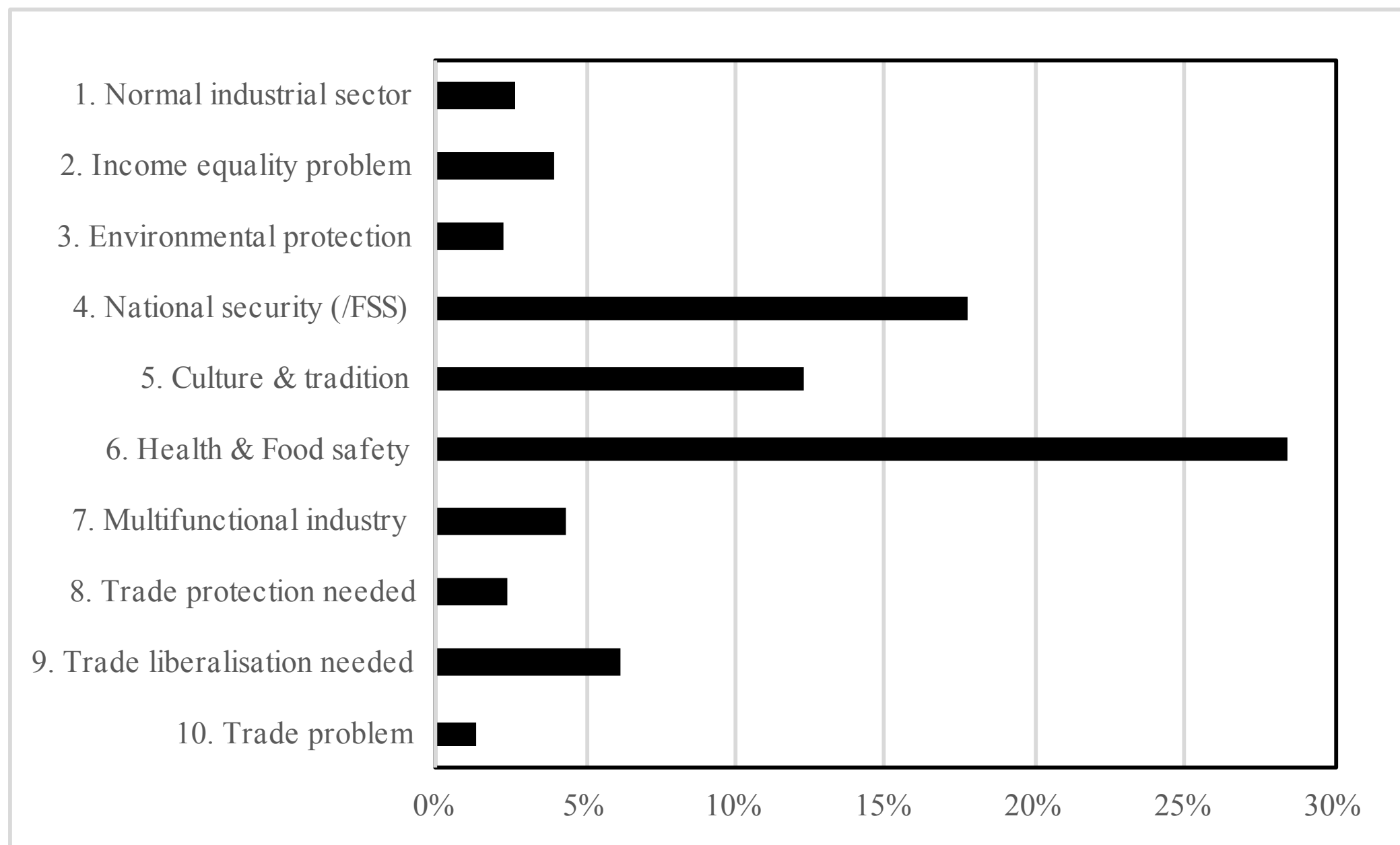
- ❖ Double cost of agricultural support, as taxpayers, and consumers of expensive foods
 - ❖ But seemingly willing to bear these
- ❖ Major concerns in relation to agriculture:
 - ❖ health
 - ❖ food safety
 - ❖ food self-sufficiency
 - ❖ culture and traditions around agriculture

*What sort of image do you have about "agriculture"?
Please choose the most appropriate answer from below.*



Source: APIR online survey, March 2015. N=500.

From the “related” answers you chose in the previous question, which has the most strongly associated image?



Source: APIR online survey, March 2015. N=500.

Concepts

- ❖ **Food self-sufficiency** (自給率, *jikyūritsu*)
- ❖ **Sixth sector industrialization** (第6次産業化, *dairokuji sangyōka*)
- ❖ **Local production for local consumption** (地産地消, *chisan chishō*)
- ❖ **‘Brandization’** (ブランド化, *burandoka*)
- ❖ **Agricultural exports**
- ❖ **Agriculture-welfare cooperation** (農福連携, *nōfuku renkei*)

(2) Urban Agriculture

Types of urban agriculture

- ❖ 1. Urban farming
- ❖ 2. Peri-urban farming
- ❖ 3. Non-commercial micro-farming
- ❖ 4. Vertical farming/ plant factories
- ❖ 5. Greenhouse farming
- ❖ 6. Rooftop farming, green curtains, urban orchards etc

Benefits of UPA

- ❖ Local access to **fresh foods**
- ❖ Greater **traceability** in food chain
- ❖ Greater **food self-sufficiency** for cities
- ❖ Potentially lower **environmental** footprint
- ❖ Increased urban **biodiversity**
- ❖ Employment opportunities, social interactions

2015 Urban Agriculture Basic Law

Basic Act for the Promotion of Urban Agriculture

- ❖ Defines Urban Agriculture as “*Agriculture carried out in built-up residential districts and surrounding areas*”
- ❖ Notes effect of population decline on city spaces, and population aging
- ❖ Obligates national and local governments to promote urban farming

新鮮な農産物の供給

*Supply fresh
agricultural produce*



災害時の防災空間

*Disaster
evacuation space*



農業体験・学習、交流の場

*Place for agricultural
experience, education,
exchange*



《 都市農業振興基本法第3条第1項
で規定する都市農業の多様な機能 》

国土・環境の保全

*Protect land &
environment*



良好な景観の形成

*Create
pleasant scenery*



都市住民の農業への理解の醸成

*Develop urban residents'
understanding
of agriculture*



*Source: Ministry of
Agriculture, Forestry
and Fisheries, 2016*

Agricultural land by MAFF's area classification

- Urban
- Plains
- Semi-mountainous
- Mountainous

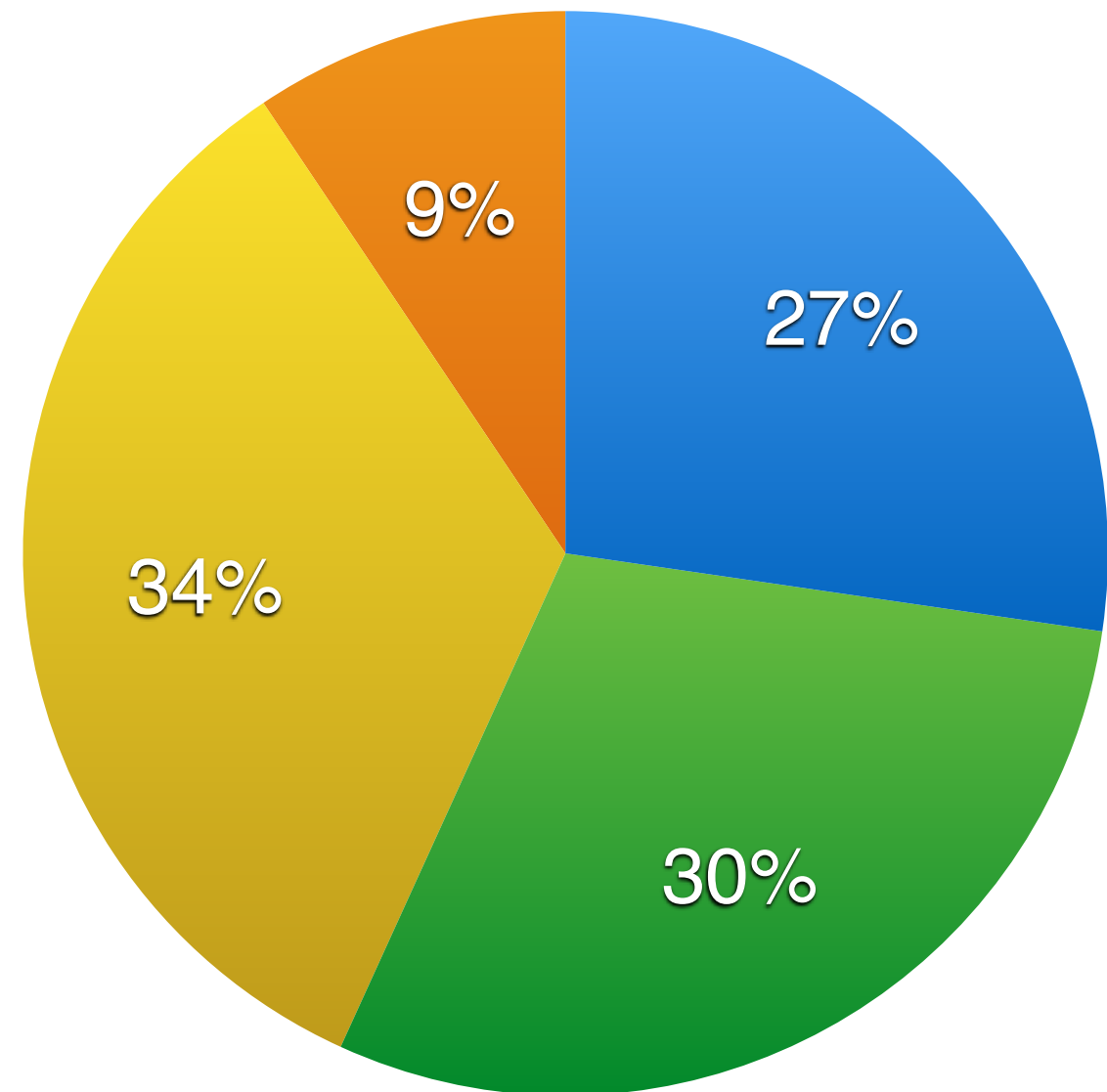


Table 1: Productivity by land and household

		Urban	Plain	Semi- mountainou	Mountain- ous	TOTAL
Output	(100m yen)	27,505	26,352	27,385	6,817	88,059
Output	%	31.2	29.9	31.1	7.7	100
Cultivated Area	1000ha	1250	1369	1555	434	4608
Cultivated Area	%	27.1	29.7	33.7	9.4	100
No. farmers	1000 households	708	911	859	370	2848
No. farmers	%	24.9	32	30.2	13	100
Productivity (land)	output/area	1.15	1.01	0.92	0.82	1
Productivity (households)	output/ household	1.25	0.93	1.03	0.59	1

Based on Moreno-Penaranda, 2016

Data Source: MAFF, 2009

Table 2: Comparison of farm sizes

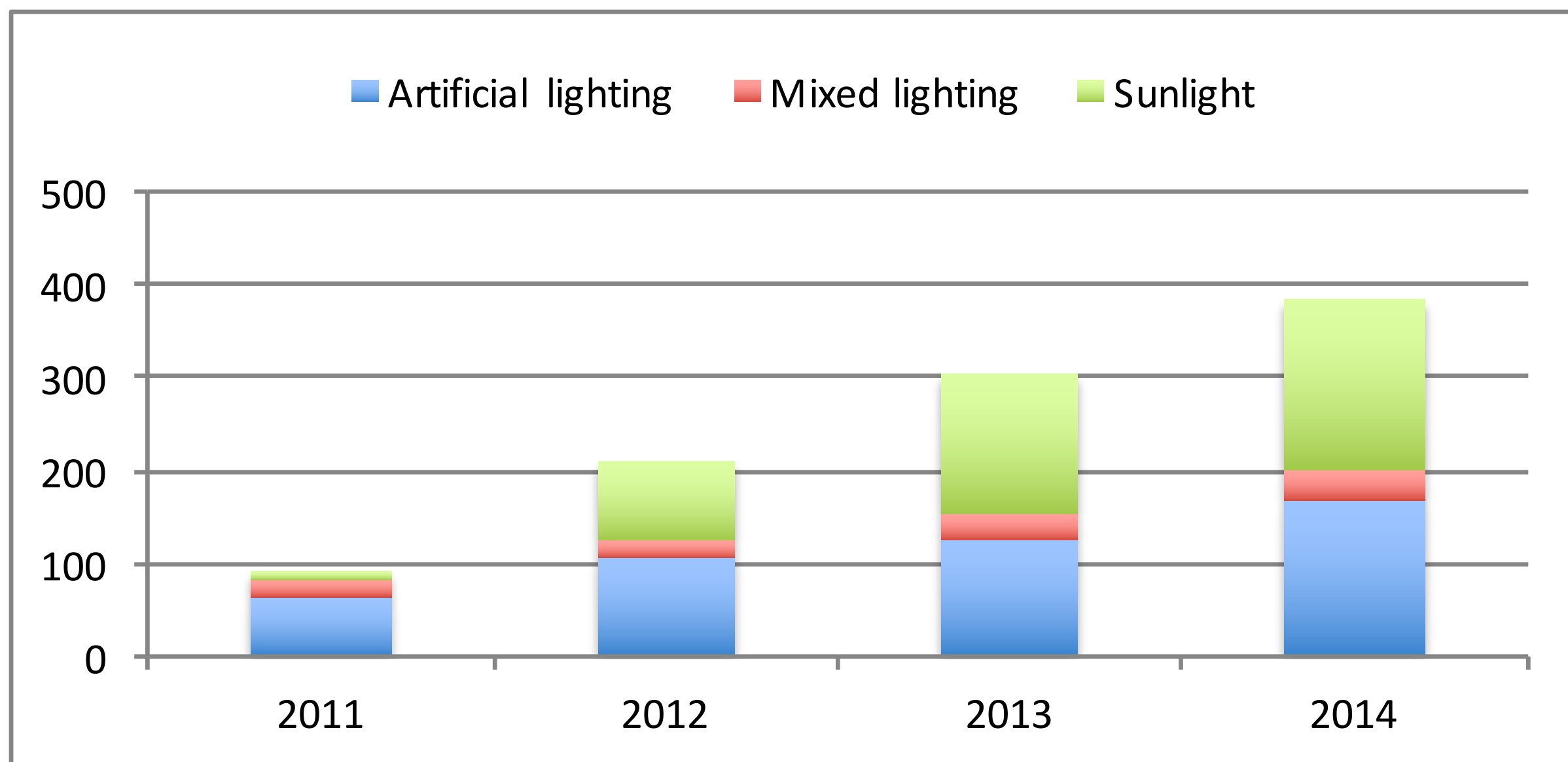
Type of farm	Average size (ha)
All farms	1.33
Urban farm	0.75
Urban farm in Tokyo-Osaka-Nagoya	0.64
Urban farm in provincial cities	0.93

Table 3: Share of urban agriculture output by category (%)

	Tokyo	Osaka
Vegetables	59	44
Horticulture	17	6
Fruit	11	17
Other	13	33

(3) Urban Agriculture in Kansai: Case Studies

Number of Plant Factories in Japan, 2011-2014



Source: Japan Greenhouse Horticulture Association

Plant Factories



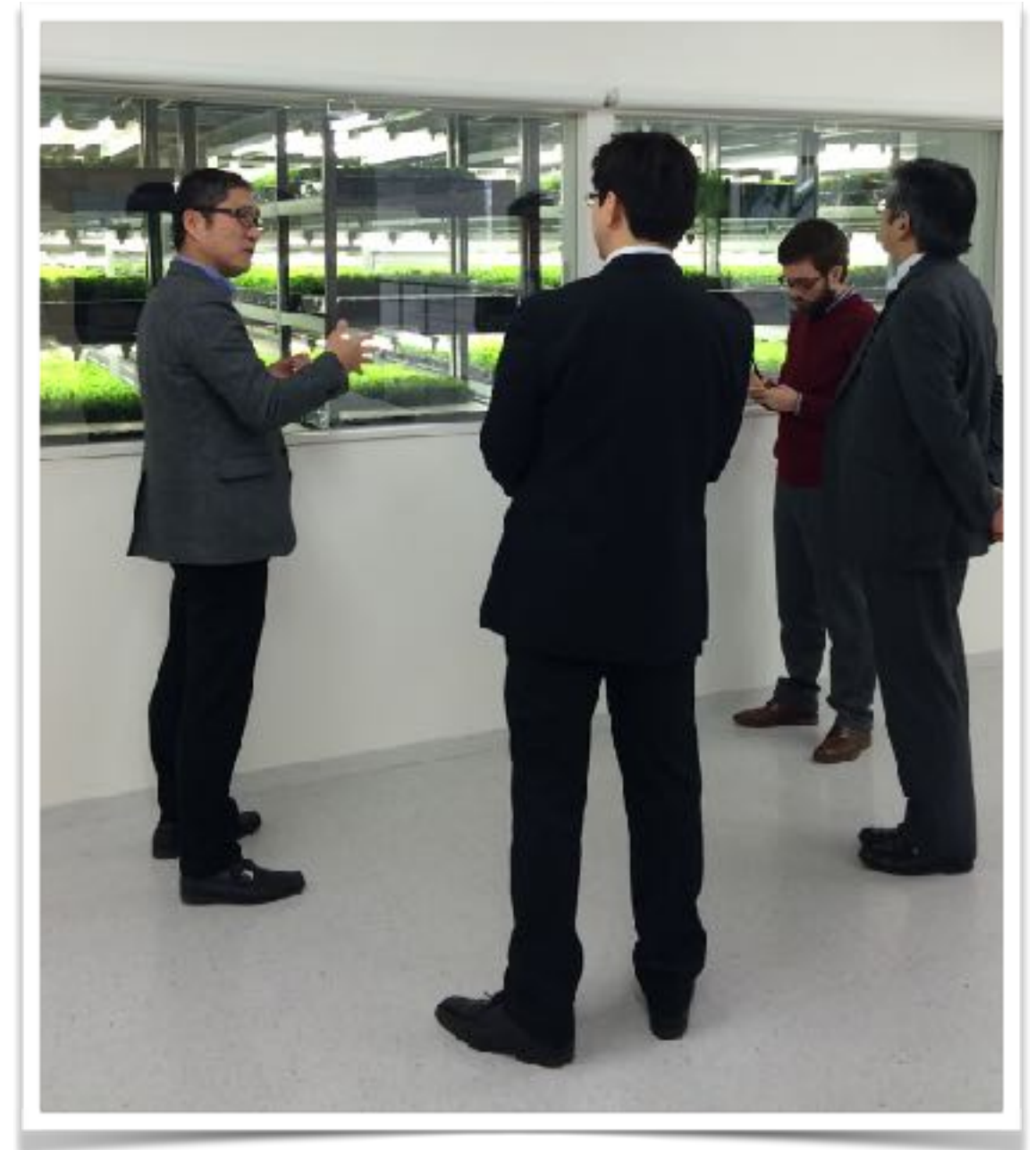
- ❖ Factor intensity: intensive in capital, not land
- ❖ Higher production: multiple levels, multiple crops
- ❖ Stable year-round supply
- ❖ Less intensive in water, low / no pesticides
- ❖ Can be located in low-value urban land plots



- ❖ High start-up costs
- ❖ High energy costs
- ❖ Environmental sustainability?

Lettuce Factory

	Field cultivation	Factory cultivation
Annual production per 1000m ² (heads)	3,560	289,683
Crop cycle (days)	60	42
Crop cycles per year	1	8
Electricity usage (kw/head)	0	1.75
Labour cost (yen per head)	0	19
Water usage (litres/head)	10.725	0.825



Sand Cultivation



- ❖ Plants in loamy sand
- ❖ Nutrients pumped through tubes
- ❖ Energy efficient insulated houses
- ❖ Waist-level cultivation for accessibility and plant protection

Shiitake Workshop

- ❖ Stumps made from wood chip, usable 3 times
- ❖ System of heating and cooling
- ❖ Aim to create and share a profitable business model for employment of elderly or disabled



(4) Conclusion:
Is Urban Agriculture
in Japan Sustainable?

Weaknesses in traditional agriculture

- ❖ Land-intensive crops (rice, wheat, etc)
- ❖ Reliance on government subsidies
- ❖ Lack of business focus
- ❖ Lack of innovation

Strengths of urban agriculture

- ❖ Focus on non-land-intensive crops
- ❖ Adopting innovating technologies
- ❖ Higher productivity
- ❖ More organic production
- ❖ Business focus, developing sales routes

Prospects for urban agriculture

- ❖ Matches factor endowments
- ❖ Matches consumer preferences
- ❖ Matches demographic trends
- ❖ Higher profitability
- ❖ Corporate involvement stimulating 'innovation'
- ❖ OUTLOOK...

Conclusion

❖ Positive prospects, economically and socially...

... with some qualifications

End

Past lessons and future spatial direction for Ireland

Aspects of agglomeration
and influences on the economic role of cities

Dr Brian Hughes



What do cities exist?; What makes them grow?

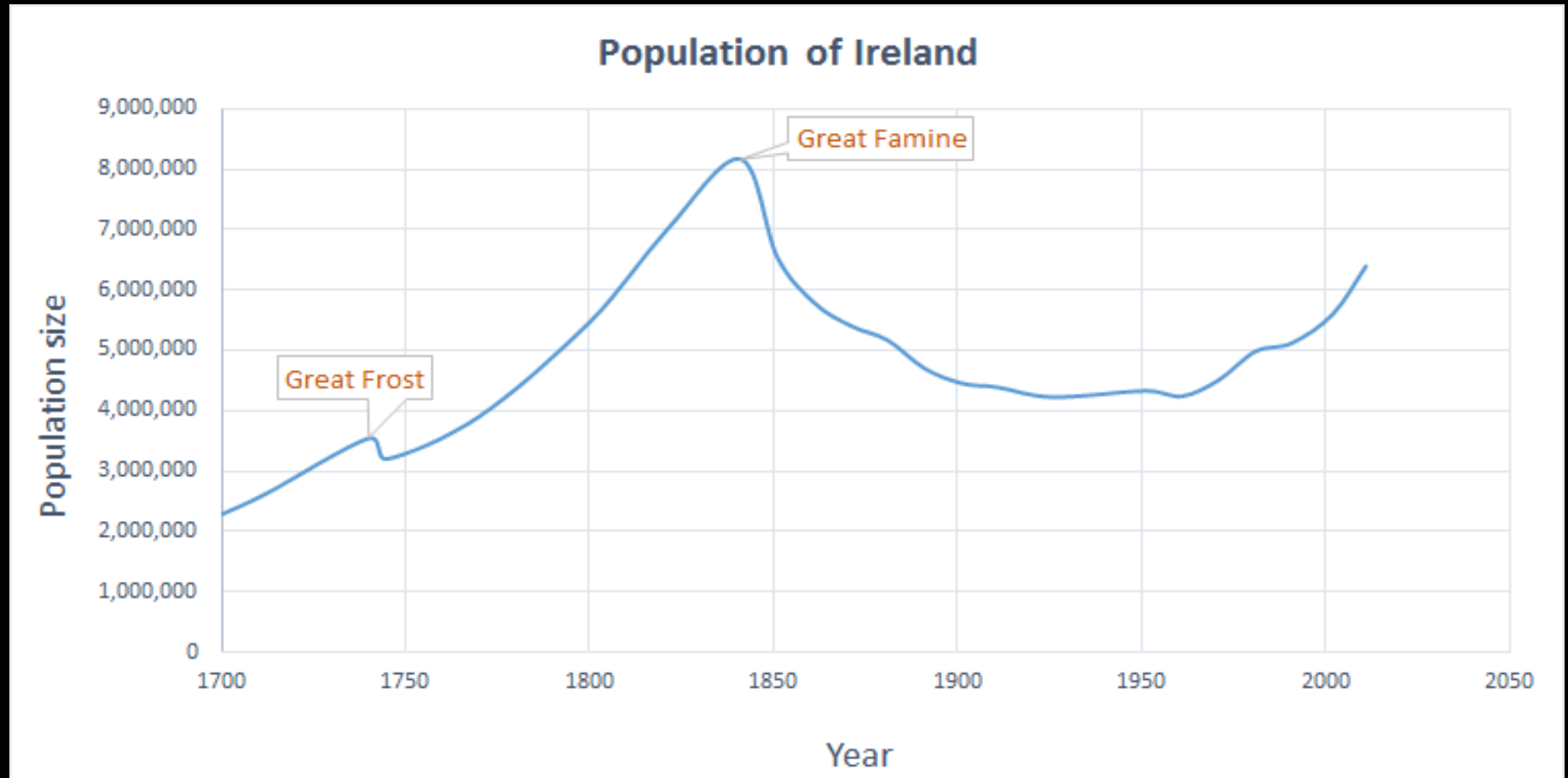
At its heart, it's all about demographics

Table 1: Japan and Ireland Population Comparisons
(Millions)

	Japan	Ireland	Multiple
1841	26.95	8.44	3.19
1961	92.93	4.25	21.87
2016 (p)	126.39	6.62	19.09
2041 (f)	121.84	8.62	13.85

Source: Brian Hughes, based on Populstat.info.HTML

Demographic history - population of Ireland: 1700-present:



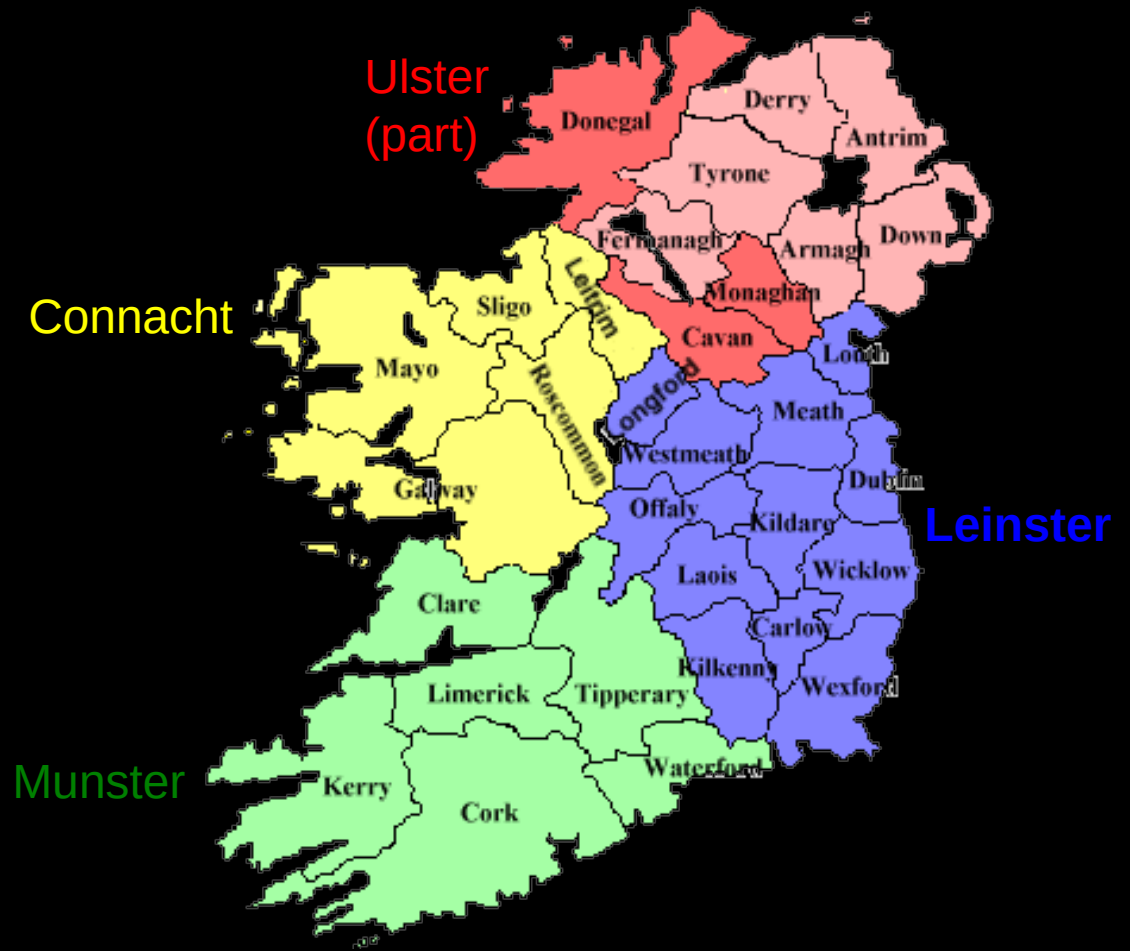
Population densities comparison – Japan and Ireland:

Table 2: Japan and Ireland Density comparisons

Population per sq.km.	Japan	Ireland	Ireland as % of Japan's density
1841	71.31	99.96	140.18
1961	245.89	50.34	20.47
2016 (p)	334.43	78.41	23.45
2031 (f)	364.39	94.99	26.07

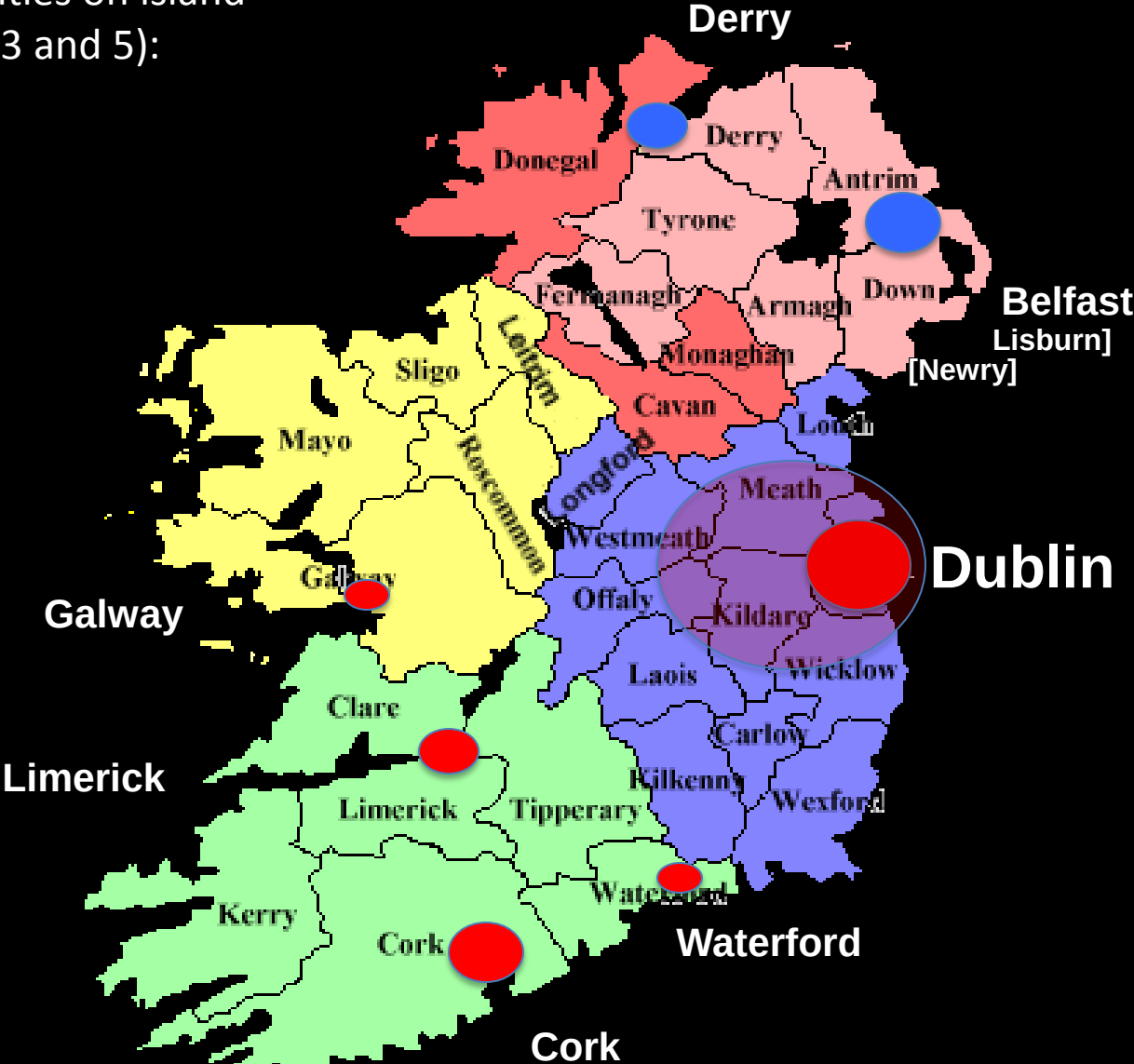
Source: Brian Hughes, based on Populstat.info

Taking 1841 as base
date, provincial
population fluctuations:



Year	RoI	Leinster	Munster	Connacht	Ulster (part)
1841	100.00	100.00	100.00	100.00	100.00
1961	48.17	67.49	35.44	29.56	29.39
2016	72.88	133.62	53.47	38.88	40.05

Location of cities on island
(refer Tables 3 and 5):



Jane Jacobs' five stages of growth:

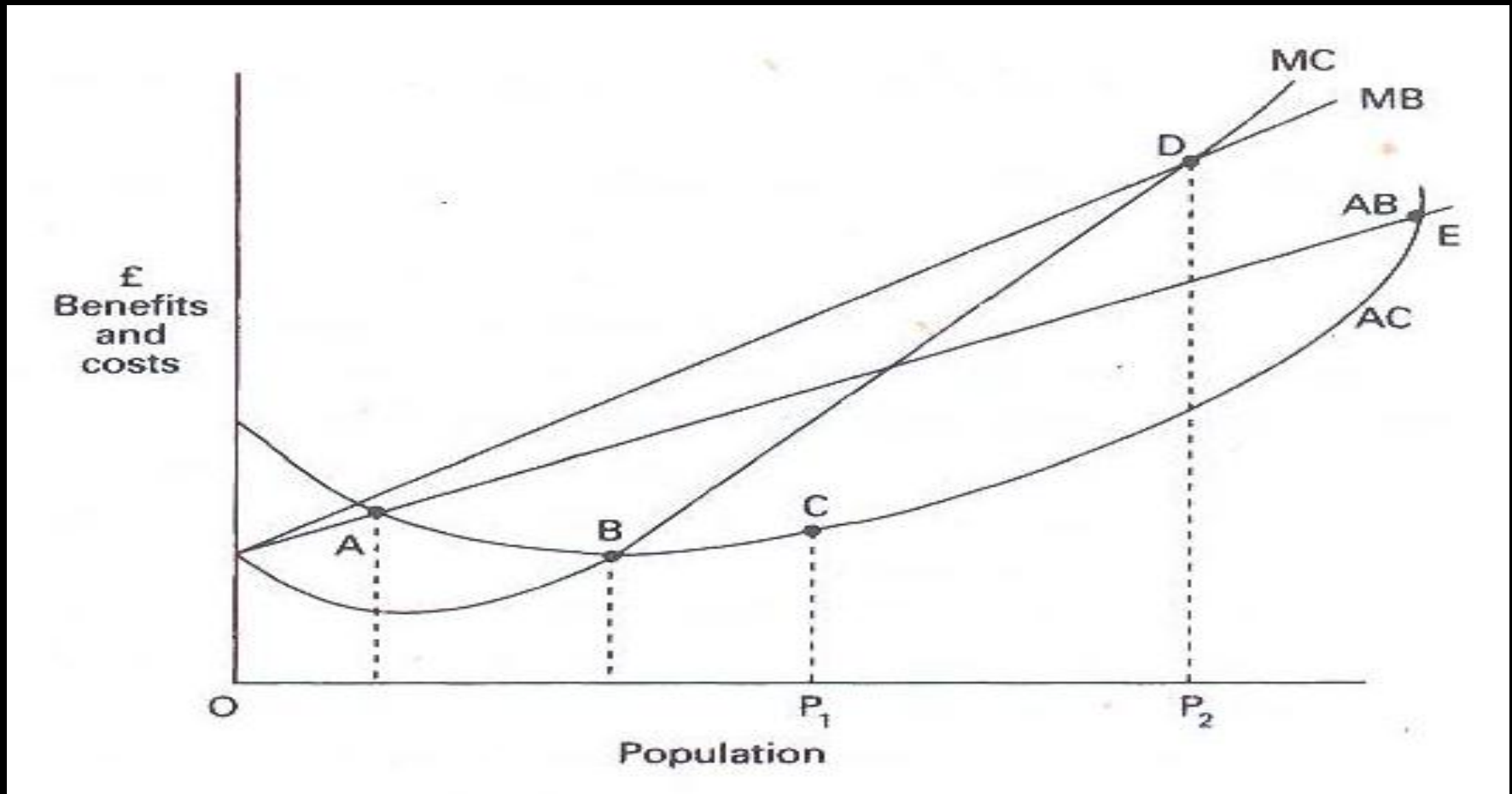
1. The Simple Export-Generating Process
2. The Import-Replacement Process
3. Export Generation into Large Cities
4. The Two-Reciprocating Systems, (for simple and subsequent cycles), and
5. Correlation of these four stages with conclusions as to the nature and change of 'work' which Jacobs foresaw, as becoming increasingly cerebral and services-orientated.

Requirements for future city growth in Ireland:

1. Sustained investment in infrastructural improvement (eg Dublin's Eastern by-pass)
2. A positive land-use/ transportation interface with long-term goals
1. Monocentric morphologies as opposed to Polycentric spread of commuter belt
2. Reducing home-to-work, schools and college-journeys
3. Edge-city policy and land management/City densification and increased building heights
4. The focus on arresting the proliferation of rural one-off housing
1. Improved competitiveness linked to supply of affordable accommodation

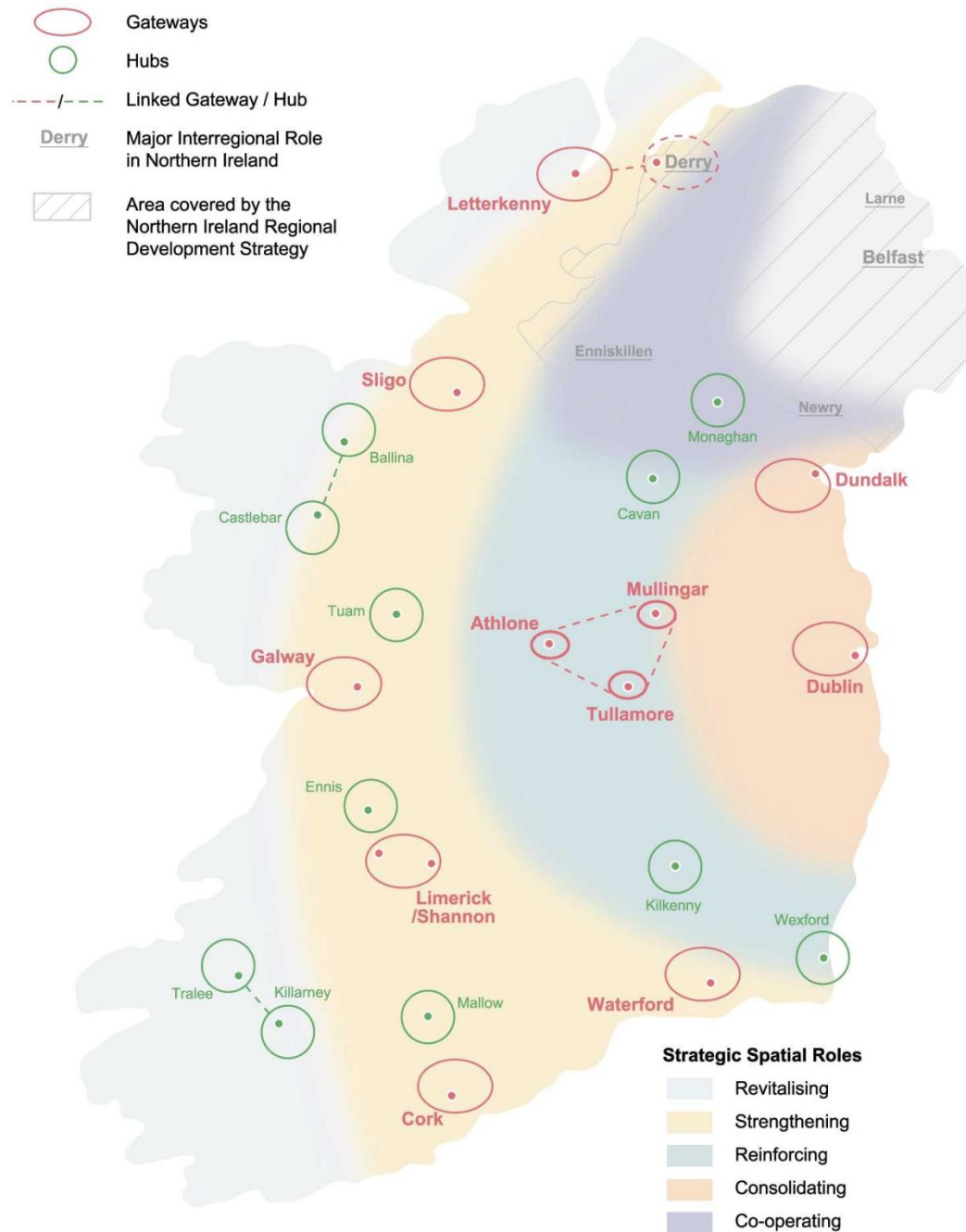
Alonso's costs and benefits of city size (1971) – commentary/population:

MB = Marginal Benefits; MC = Marginal Costs; AB = Average Benefits; AC = Average Costs.



Policies responses:

National Spatial Strategy (2002-2020 [aborted 2012])	National Planning Framework (2017 - ?)
Hubs and gateways (too many)	Cities and a few other growth centres?
Politically driven	Evidence-based driven?
Area-based rather than city- based	Regions not approved by EU for three proposed regions?
Backed wrong horses (e.g. Dundalk or Sligo instead of Drogheda-LBM)	Non-specific relying on three regional documents

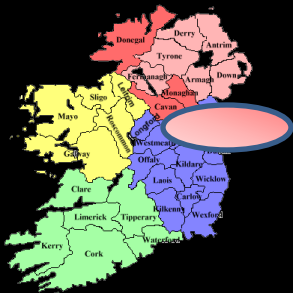


What can we learn from Ireland's mistakes?:

1. Ignore cities at our peril.
2. Healthy regions depend on a sizeable city.
3. An over-bearance of both local politics and politicians.
4. Plans need to be flexible to allow for unknowns.
5. Need for accurate data (housing, population etc.).
6. Need to prefer centripetal forces over cetrifugal ones - with densification

1. We ignore (potential) cities at our peril.

Laytown-
Bettystown-
Mornington

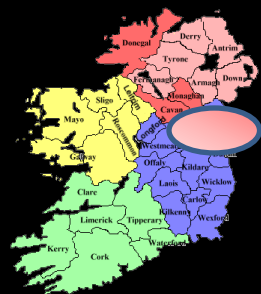


Drogheda

131	54	86	9	28	107	58	97	40	37	-
26	6	27	59	58	84	52	83	5	-	-
20	17	61	16	449	153	79	65	99	-	-
74	219	2,643	3,308	2,423	10	5	80	489	376	-
1,212	1,534	3,226	3,553	823	5	46	112	275	1,059	-
1,028	3,631	3,183	2,727	2,411	2,470	673	752	748	691	-
73	553	494	705	435	861	56	13	1,224	2,162	185
42	20	80	62	45	13	106	11	90	705	392
5	25	87	-	85	5	15	20	35	443	1,378
51	25	5	61	76	43	52	253	223	21	8

2,662 6,084 9,892 10,500 6,833 3,751 1,142 1,486 3,228 5,424 1,963 52,505

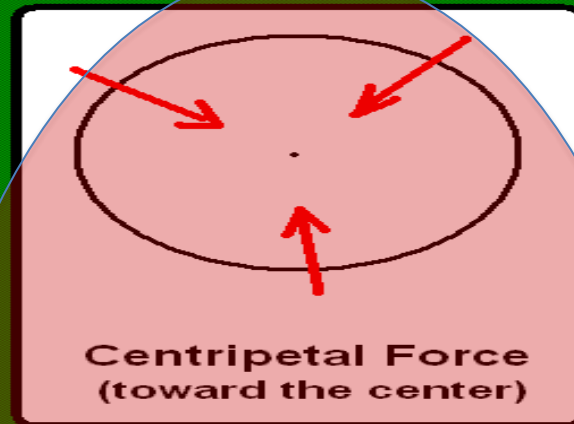
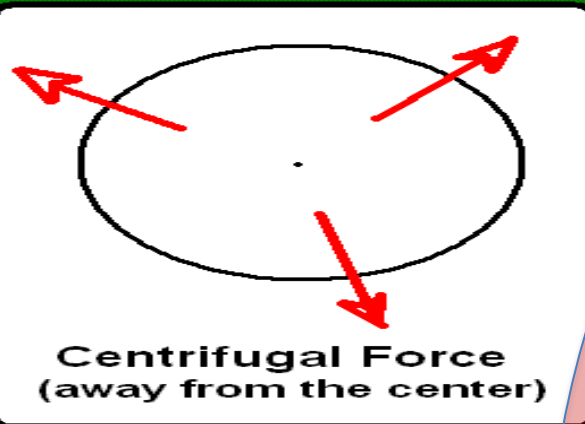
Laytown-
Bettystown-
Mornington



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Drogheda

2,662 6,084 9,892 10,500 6,833 3,751 1,142 1,486 3,228 5,424 1,963 52,505



Centrifugal	Centripetal
Polycentric	Density
Immobile factors (land)	Linkages
Rents and values	Thick markets
Congestion and other diseconomies	Knowledge spillovers
Cottage industries	Technology

**International lessons and
future spatial direction
for ireland**

Aspects of agglomeration
and influences of the economic role of cities

Thank you
Dr Brian Hughes

Contact: Brian.Hughes@dit.ie

International Lessons for the Future Spatial Direction for Ireland: aspects of agglomeration and their influences on the economic role of cities

Dr Brian Hughes

© 2017

Abstract

Ireland's demography in the world context is unique. Its population count remains the same as it was some 200 years ago and yet it has experienced profound movements. This paper contrasts Ireland's changing demography with that of Japan since the 1840's, for these the two offshore nations, located off either end of the Eurasian land mass. Historic urban literature identifies that governmental policies towards cities and city-based industry and services appears to explain many of these contrasts. In Ireland's case such policy both prior to and since the formation of the State has been an ambivalent one that has not favoured the growth of its provincial cities. Ireland's forthcoming National Planning Framework provides a policy opportunity to change policy direction and opt for intensive city growth. Urban economic and new economic geography advances show that Ireland is no different from similar nations and the principal question for the future is: will the focus of development be in favour of its secondary cities or will Dublin by default become Ireland's city state of the 21st century?

The choice is to remain with the failed policies of the last spatial plan, premised on balanced regional development, which has created many additional villages, small towns and one-off housing while Ireland's provincial cities get left further behind compared with 'primate' Dublin. The paper provides interesting insights into the preliminary 2016 census figures to portray the contrasting populations and regional growth differences. Celebrated world urban experts, including Japan's Masahisa Fujita and Nobel Prize winner Paul Krugman and also Jacques-Francois Thisse, all emphasise the wealth creation benefits of cities, driven by the move from physical to cerebral types of work and to the concentration of economic activity.

The paper reviews some of the major players on the world stage of Urban Economics and the New Economic Geography. It points to future demographic possibilities and concludes that the adoption of urban-agglomeration policies of densification, centripetal rather than centrifugal growth and a positive land-use/ transportation interface with the objective of reducing commuting times, all will enhance competitiveness and which should inform Ireland's spatial policy direction.

1. Introduction:

The commencement point is that of the classic literature of Jane Jacobs in *The Economy of Cities* (1969), wherein, she contrasts the 19th century industrialisation of an independent, emerging Japan with the political and economic subjugation that had retarded a colonised Ireland. These contrasts between Japan and Ireland are stark. Jacobs vividly describes the desperate subjugation of the Irish people (and to quote from P. 11) *...were held in an iron economic and social subjection. But that the very core of that subjection – and the reason that it was so effective and had rendered Ireland so helpless – was the systematic suppression of city industry, the same suppression in principle that the English had unsuccessfully tried to enforce upon industry of the little cities of the American colonies.*

Jacobs also noted the 19th Century similarities: geographical offshore Islands located at the opposite edges of the massive Eurasian land-mass. During the 1840s Japan's population was a static one and at 26.9 million it was a little over three times that of Ireland's 'high point', of 8.4 million in 1841. So the question arising in the first Table is: why did Japan's population grow from three times that of Ireland's to nearly twenty-two times its size over a 120 year period 1841 to 1961?

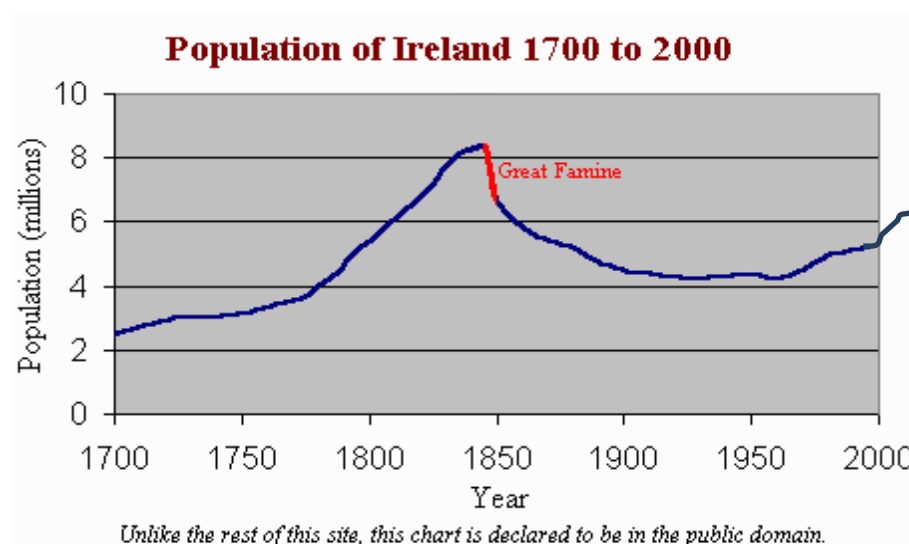
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1961	92.93	4.25	21.87
2016 (p)	126.39	6.62	19.09
2041 (f)	121.84	8.62	13.85

Source: Brian Hughes, based on Populstat.info.HTML

2. Demography:

In the global context Ireland presents a unique demographic case in its dramatic population decline between 1841 and 1961. Even though it has recovered and has grown by nearly 60% in population since 1961, today it is still some 1.7 million below 1841 census of 8.4 million - some 175 years further on. The following graph shows the overall performance of the island's population for the last 300 years, thus:



Source: Wesleyjohnston.com - up to about 1990; since then the graph continues upward to 6.61 m.

[This author has extended the indicative Wesley Johnston graph line beyond 2000 to take account of further population growth into this century – pending release of the final 2016 CSO census results in mid-2017, whilst noting that the results for Northern Ireland are next due, for the 2021 UK census, in 2022/3]

Because of its weak urban base, the Republic of Ireland (RoI) reached its lowest population of just 2.818m together with Northern Ireland's (NI) 1.4 m (approx.) so by that 1961 date the Island had just

4.20 million people. Japan had grown to 92.93 million by then – i.e. by 22.2 times that of Ireland, whose population was a little over half of its 1841 figure. Today, RoI is still only 72.88% of its 1841 population, but that's not the full picture. At its lowest point in the census of 1961 the RoI part was just 43.17% of its 1841 population of 6,528,799. By 2011 the RoI had recovered 47.78% of the 1841-1961 population loss and the recovery was up to 52.27% by the 2016 preliminary census total. Today, the island's population of 6.62 million comprises a 72% living in RoI with 28% in NI.

Looking ahead, the 2050 projections for a total island population is in the 9-10 million range. Here it is necessary to make the obligatory disclaimer for professional demographers. They are always reticent in projecting levels of growth that are more than twenty years out, primarily because it means having to make fertility predictions for birth-mothers, some of whom have not yet been born!

Significant dissimilarities, in comparing 19th century Ireland with Japan, commences with their political systems and governance. Japan's and legacy notes the Shogun's embrace of western technology: especially of a famous Scottish influence. Enter Aberdeenshire's entrepreneur and industrialist Thomas Blake Glover. The Japanese Times, for its part, notes an issue of cultural disparity:

However, there's an anomalous legacy of Glover and his ilk, too, thanks to the persistence of a mid-Victorian typology of discrete ethnicities with which he would have felt quite at home. Hence, in the received wisdom of today's Japan, Glover's fame has slipped far below that of the Tosa revolutionary Sakamoto Ryoma, despite the latter quite likely having been less influential in bringing about the Meiji Restoration. But Sakamoto is now better remembered, not because of Glover's dubious dealing, but because he is imagined to better encapsulate the modern Japanese spirit.

3. Early Industrialisation – Comparing Japan and Ireland:

Persisting with this 'spirit', the first imported and then locally-produced Bicycle epitomises Japan's infatuation with early technology and industrialisation as exemplified by Jane Jacobs in *her* book (1969). In 19th century independent Japan with accelerating city industrialisation is contrasted with the colonially, 'subjugated' Ireland as Jacobs described; it focused on primitive agriculture with London's iron grip on limiting industrialisation so that their colonies do not compete with mainland Britain. The contrasting outcome: Japan's dramatic progress in technical prowess - its adoption and in further adaptation of western industrialisation, demonstrated in its meteoric technological mastery; conclusively demonstrated in the astonishing naval outcome at Tsushima, in its comprehensive defeat of the Tsarist Russia's navy in 1905.

Ireland in contrast, experienced a very limited scale of Industrialisation: first Belfast grew from a small town in 1800 to exceed Dublin's population in the census of 1911. Thus Belfast, for the first and only recorded time, was then larger than Dublin. Ireland's fraught history of stultified industrialisation, culminated in an eight-year period of fratricidal military belligerence, starting with the failed Rising of 1916, then the War of Independence and a bitter Civil War, which resulted in partial Independence by way of Free State status in December 1922, an economic 'war' with Britain and culminating in the 1948 Declaration of the Republic of Ireland (RoI). Thus today's Dublin is about twice the population of Belfast, pending the 2021 census, the UK census being held every ten years.

Heavy manufacturing Industry developed quickly in Northern Ireland with its foundation of shipbuilding, linen, and engineering compared with food, drink and tobacco in RoI. The South's traditional agriculture with focus on food/ drink exports to Britain is such that even today agriculture is still over-dependent and the uncertainties posed by 'Brexit' will present further challenges!

Today's political division of the island's 6.61 million people has the RoI 4.76m as a Member State of the EU; Northern Ireland at 1.85m is part of 67m UK which has voted to exit the EU. Ireland's geography is described as having a Tundra level of population density of only 78.32 per sq. km. as at 2016 despite its temperate-climate location.

Such demographic sparsity creates significant public and private service-delivery problems due to inevitable dis-economies of scale. At 84,431 sq.km. Ireland is marginally smaller than the US State of Indiana. In contrast, Japan at 377,930 sq.km., is some 5.52 times bigger than the surface area of the RoI and it is 4.48 times the size of the entire island of Ireland.

As the next Table shows, it surprises most people including myself, that in 1841 the island of Ireland's population density, at that point was over 40% greater than Japan's. However, with the Great Famine of 1845-1849 and the enforced emigration combined with an absence of sizeable cities, quickly shrunk with its spectacular collapse of population so that even with today's recovery, and with an absence of even medium-sized cities it is less than one-quarter as dense as Japan.

Table 2: Japan and Ireland Density comparisons

Population per sq.km.	Japan	Ireland	Ireland as % of Japan's density
1841	71.31	99.96	140.18
1961	245.89	50.34	20.47
2016 (p)	334.43	78.41	23.45
2031 (f)	364.39	94.99	26.07

Source: Brian Hughes, based on Populstat.info.HTML

Because of its sustained emigration, Ireland is responsible for a world diaspora that is now estimated at over seventy million. Japan's population, having 'topped out' at 127.33 million in 2010, has marginally declined to 126.9 million in 2016, thereby being 19.2 times the size of Ireland's total 2016 population. Japan's population contraction, to-date, is of modest proportions but can, if it chooses, allow some non-indigenous in-migration so as to maintain its economic workforce. Source populstat.info.html

It is almost futile to compare Japan and Ireland cities: Tokyo is by far the world's largest one and there are many other sizeable ones by comparison with Ireland's cities. The next Table sets out the Irish cities in rank size order. In applying Zypf's 'Law' (1949) of City Rank Size, it states that the size of a country's second and subsequent city should equate to the inverse of its rank order, one-half, one-thirds and so on. The following Table 3 confirms the fragile sizes of Ireland's smaller cities and their Gini-coefficient 'shortfall' in population compared with Zypf's Law.

The following 2011 data of Table 3 city population is used because the 2016 populations for city size will not be published by the CSO until mid-2017 and the next UK census is in 2021..

Table 3: All-Island City Populations in 2011 (thousands):

City ('000)	Rank Order	2011 Population (a)	Where Dublin = 100.00%	Zipf's Law Population (b)	Zipf Target Shortfall/ [Surplus.] (b)- (a)	Zipf % extent of Shortfall [(b)-(a)/ (b)]
Dublin	1	1,110.6	100.00	1,110.6	0.0	N/A
Belfast	2	515.00	46.37	555.3	40.3	7.26
Cork	3	198.6	17.88	370.2	171.6	46.35
Derry	4	93.6	8.43	277.7	184.1	66.29
Limerick	5	91.4	8.26	222.1	130.7	58.86
Galway	6	76.8	6.92	185.1	108.3	58.51
Waterford	7	51.5	4.64	158.7	107.2	67.55
Aggregate city population 'shortfall' in relation to Dublin:					742.2	41.95

Source: CSO Principal Demographic Results, Censuses of 2011: Table 7, Areas data, together with 2008 estimates for Belfast and Derry are sourced from NISRA. Official settlement figures are not available for 2016. Both Lisburn and Newry are excluded from this earlier Table of 2011 population size. The approximate 2016 populations of Rol cities, as per this author's estimates are: Dublin at 1.165m., Cork at 0.215m., Limerick at 0.094m., Galway 0.081m and Waterford at 0.053m.

Whilst Waterford is the next largest settlement after Galway, exclusive of settlements north of the border, Belfast's population includes that of contiguous Lisburn, Glengormley, Castlereagh, Carrigfergus, Newtownabbey, Bangor together with seven smaller settlements, based on NISRA 2008 estimates, *vide*, <http://ninis2.nisra.gov.uk/public/pivotgrid.aspx?dataSetVars=ds-1931-lh-69-yn-1971,1981,1991,...> Derry's includes New Buildings, Strathfoyle and Culmore.

Analysis: Brian Hughes.

Note: This aggregate 'shortfall' in population represents 11.60% of the all-Ireland 2011 population of 6.4 million.

The Gini Coefficient shortfall for above Table is calculated at 41.95% which reflects a considerable level of city-size distortion, mitigated somewhat by Belfast's 'relative normality' and Derry's (2008) inclusion on the basis of the stated size-difference with Limerick (2011). The measure of Ireland's distortion in city size is compatible with a 'basket' of Western European cities, *vide* Eurostat populations, 2011. This however, notes that smaller countries have a greater size variance in comparison with larger ones, due to their 'primate settlement' effect of their largest cities. This finding supports the view that for small countries or provinces, as in the cases of the Republic and of Northern Ireland, primacy is to be expected, simply based on the limited size of entity. This is supported in research by Mansury, Y. and Gulyas, L. (2006). Some cited opponents to excessive urbanisation and agglomeration would argue the opposite: that Dublin and Belfast are too large!

For the RoI cities on their own, the Gini shortfall is more pronounced, at 70.65% and at over one million, representing 22% of its total 2011 population. Nevertheless, in terms of achieving scale economies, future Irish governments should seek to reduce such Rank-size and Gini shortfalls: a policy initiative that would require them to commit to seriously growing the State's 'provincial' cities, especially having regard to the increasing importance of the Producer Services sector and in particular, of the economic dynamics of the 'knowledge economy', based on sufficiency of human resources and in recognition of the role of economic clusters, vide Strange (2005), Appendix 5.

Vital to any country's economic prospects is not just its population endowment but in particular, its density as evidenced in its cities. This next Table is an up-to-date summation of the island of Ireland:

Table 4: Composition of Ireland, cities and population density - 2016

	Republic Ireland	of Northern Ireland	RoI % of Island
2016 (p) Population	4,757,976	1,855,000 (est.)	71.95%
Cities – population	1,614,000 (5)	885,000 (4)	64.59%
Remainder of pop.	3,143,976	970,000	76.42%
Surface Areas	68,466 sq.km.	15,965 sq.km.	81.09%
Density per sq. km.	69.49/ sq.km.	116.19/ sq.km.	78.32/ sq.km.

Source: Brian Hughes, based on Eurostat and on his 2016 estimates for cities

These data confirm that whereas the RoI has over 81% share of the Island's surface area, it comprises just over 64% of its city population and 76% of the entire population. This Table also shows that the RoI population density is only 67% of Northern Ireland. The reality is that even after gaining limited Independence in December 1922, the RoI's population continued to languish out to 1961, having practically no urban or industrial policy strategy to counteract the continuing outflows of mainly rural emigration. With only one metropolitan-sized city, Dublin, the difficulty in retaining population remains a persistent problem to this day, with net outward migration in almost every other part of the State.

A significant factor in retarding the State's economic growth has been a long-standing government antipathy towards the development of its cities. At its lowest point of population in 1961 the aggregate population of the five cities was 33.1% of State compared to 29.2% for the world's cities share of world population. However, by 1986 the State's cities share of population had remained almost static at 33.8% when the share of all cities had risen to just over 40% of world population. This divergence persists where the 2016 (preliminary) State population share in its cities is just 34.1% at a time when the corresponding figure for aggregate world cities has risen to 54% of world population. The following data confirms the inexorable eastward shift of Ireland's overall population distribution and recent growth performance, the next Table sets out the contrasting picture as between the East and West of Ireland (see next Table 5, showing the 5 'provincial', demographic components of RoI).

Table 5: Provincial Populations - Imbalanced Recent Growth Performances

5 Provinces:	Census 2011 Populations	Preliminary 2016 Populations	2011-2016 pop. growth contributions	5-year % growth	% of State surface area	% share of Population growth
Dublin	1,273,069	1,345,402	72,333	5.68%	1.35	42.62%
Rest of Leinster	1,231,745	1,285,318	53,573	4.35%	27.26	31.56%
Munster	1,246,088	1,280,394	34,306	2.75%	35.12	20.21%
Connacht	542,547	550,742	8,195	1.51%	24.74	4.82%
Ulster (part)	294,803	296,120	1,317	0.45%	11.53	0.79%
Ireland	4,588,252	4,757,976	169,724	3.70%	100.00	100.00%
Source: Brian Hughes analysis of CSO 2011 Census and 2016 CSO Preliminary Data						

This Table comprises Rol's provincial composition where Dublin (city and county) is separated from the remaining eleven Leinster counties and that of Munster, then Connacht and finally the three Ulster counties. Table 5 highlights the striking 2011-2016 growth differences and sharply dis-improving population performances contrasting Dublin and the smaller-populated provinces, especially when they are compared with the State's overall growth. Population densities (not shown): Dublin City + County is 21 times the density of Rest of Leinster, 27 times that of Munster and 43 times the density of Connacht + Ulster (pt.). The Greater Dublin Area, comprising counties Dublin, Kildare, Meath and Wicklow, at 1.9 million people for the first time exceeds 40% of State population and is also larger than Northern Ireland. The Rest of Leinster has replaced Munster in the 2016 rank order and all-Leinster comprised 74.18% of total Rol 2011-2016 population growth.

4. Absence and Failures of City-growth Spatial Policies:

When the first opportunity did present itself to espouse the planned acceleration of urban growth for Rol in the form of the Buchanan Plan of 1969, it was firmly rejected by that government on the grounds that it would be too disruptive and biased in favour of cities. That Plan would have required an accelerated programme for housing construction, principally in the provincial cities of Cork and Limerick, together with more modest expansion for six other moderate sized cities and towns. Significantly, support for the plan was confined to the Department of Finance.

Irish governments have always been wary of planned growth, that might seek to favour one location, county or province over others and so the only other spatial plan had to wait until the 21st century to emerge. As with our cities, politics and planning do not make for friendly bedfellows in Ireland! That is why, for future spatial planning to achieve 'buy-in', it must first be de-politicised whilst also obtaining cross-party political support. Shortly after the millennium, the introduction of the National Spatial Strategy (2002-2020) was based on the premise of *Balanced Regional Development* (BRD), *vide* Appendix 1. It has proved to be a near-complete failure – in this writer's opinion – because BRD is unviable in unrealistically seeking to support all regions, towns and villages – it is non-discriminatory, with "a one for everybody in the audience" approach to growth expectation.

Until it was quietly withdrawn after only nine of its eighteen year life-cycle in 2012, all that the NSS had succeeded in doing was to accelerate the formation and proliferation of hundreds of additional villages and many small towns together with thousands of additional one-off houses and increasing long-distance commuting. RoI's settlement pattern now comprises over 200 (mainly) small towns and nearly 700 villages of up to 1,500 in population – the minimum threshold which defines the smallest populated 'town'. It is interesting to note the recent announcement of the latest government initiative for 600 small towns and villages with an initial budget of €60 million; that is an average of €100,000 per settlement, spread over a three-year timeframe.

In maintaining widespread population dispersal, after 2002 the five cities lost further population share and some of the eighteen other growth centres called 'Gateways' or 'Hubs' have stagnated and some have even lost population. In short, poor strategic choices were made in the selection of growth centres and too many of them were chosen. Sligo notably has lost population over the last three censuses; Portlaoise was not selected despite the fact that it achieved the same population growth (2006-2011) as the aggregate growth of the three Midland-designated 'Gateway' towns of Athlone, Tullamore and Mullingar. Dundalk was however, selected as the north-east Gateway despite the impressive growth of Drogheda with Laytown-Bettystown-Mornington, now emerging as Ireland's sixth city. Fast-growing Drogheda-LBM may now have passed out the smallest city Waterford in its 2016 population, yet to be confirmed. The population details for individual settlement won't be available until mid-2017.

5. The Critical Policy Issue:

The key to Ireland's future rate of growth rests primarily with the city and with its human resource-base. To what extent will both public policy formulation and the private sector's economic response enhance the growth of Ireland's cities? Will the forthcoming National Planning Framework (NPF) policy recognise the nature and change of work in the 'knowledge economy', to densification and with its demographic growth increasingly drawn to its urban-agglomerating cities?

Will there be adequate acknowledgement of the formation of new work clusters similar to the 'knowledge cluster' of the Grand Canal area of south Dublin city or to Dublin's 'aircraft leasing cluster' which funds and manages about half of the world's commercial aircraft? To what extent will the New Economic Geography with its large potential multipliers be cherished and acknowledged in the thrust of Ireland's spatial policy formation, *vide* Appendix 3? These are the major issues that hopefully will be addressed in the NPF, to be formally launched by Minister for the Environment Simon Coveney at Maynooth University.

At present, Ireland's (all island) demographic centroid is moving further east and is now positioned, co-incidentally, close to Maynooth, which is located just 25 kilometres west of Dublin's city centre. To-date there is no formal spatial acknowledgement that Ireland's population growth is focused on the east coast, generated by the dual concentration of Dublin and Belfast (DB) metropolitan regions *vide*, Irish Times, 27.12.2016 headline, where Minister Coveney has invited the citizenry to debate role of secondary cities in forthcoming NPF. The opportunity to provide for a sixth city along the DB corridor is prescient, especially given the Brexit geo-political developments now emerging.

6. Good Spatial-Economic Practice and Harsh Economic Realities:

This writer's theoretical expectation and advocacy is that based on Japanese and other countries' experience that the direction of public spatial policy backed up with international and private investment support, should seek to achieve Pareto-Optimality wherein a win-win series of outcomes will eventuate for this entire island. This objective is not just laudable or desirable but in Ireland's case, it is an essential one, given the national legacy of debt and issues of future major economic uncertainties. Strategic spatial opportunities must therefore be grasped so as to avail of 'core' growth and 'peripheral' spill-over spatial policy outcomes.

Today, urbanisation and urban agglomeration still challenge many of our rural-based politicians as discomfiting concepts - ones that have attracted a stubborn political reluctance and even resistance, to recognise and acknowledge the potential to grow our provincial cities - this despite the fact that RoI is still only about 63% urban (2016 Preliminary Census), the five cities comprise just 1.6 million or just one-third of the near 4.76 million population of the Republic. With the demise of most 1960-1980s branch plants, industrialisation has largely bypassed or even deserted many Irish provincial towns but the services base of its cities is consolidating, featuring cerebral rather than physical output, reflecting modern Ireland's ambitions and enthusiasm for education and added value.

Post the 2009 Troika Bailout and international 'rescue' (IMF+EU+ECB), Ireland continues to retain a credit-worthiness standing as reflected in its current bond yields, despite its high 90% debt-GDP ratio. However, even with its political and economic stability Ireland remains very vulnerable to a trading position as an off-shore island economy. Likewise, our demography remains potentially fragile with propensity for two-way migration, now inward in direction since 2015. The State continues to be vulnerable as one of the most Globalised economies in the world with a rating of 170% , that is Exports + Imports / GDP.

The RoI has just one metropolitan city region plus the four much smaller Provincial cities, with their average 110,000 population which is just one-eleventh the size of and just one-third the density of Dublin. These provincial cities have an average density of 1,300 people per sq.km. Dublin's population density is approaching 4,000 and is about 6,300 for Japanese cities. Apart from the slower domestic economy, Ireland's growth expectation is FDI industry-based together with an over-dependence on agricultural. Exports: notable areas include Pharmaceuticals, Professional Consultancy, Software, Cloud-media, Medical Devices, Information Technology, Aircraft Leasing and Financial Services.

Given that nearly 75% share of RoI's 2011-2016 population growth is in Leinster (including Dublin) a reasonable case can be made for the nomination of one additional city in this part of the country. In proposing Drogheda as that new city, recognition is also being given to the pressing need to reinforce the Dublin-Belfast Corridor, given the post-Brexit geo-political context and need for all-island consolidation. The physical agglomeration of these two towns plus the fact that one of them is Ireland's largest populated town presents a clear-cut candidate for Ireland's next city.

7. Ireland's emerging new city – Drogheda-LBM ('Whitaker City'):

This prime example of urban agglomeration is located just twenty minutes from the Dublin Port Tunnel and 31 miles north of Dublin and reinforces the Dublin-Belfast Corridor, Drogheda together with another large (+10,000-populated) town, Laytown-Bettystown-Mornington (LBM) together match the population of Waterford city.

This application of the EU Harmonised Density Measure (Sq. Km.) is a very recent (2015) example of an OECD standardised practice for assessing urban agglomeration. First is set out the four-step criteria as exemplified in an Austrian city: known as the 'Graz Model' and as is then applied to Drogheda plus LBM, thus:

Until 2015, there was no harmonized definition of 'a city' for European and other countries as member of the Organization for Economic Co-operation and Development (OECD). This undermined the comparability, and thus also the credibility, of international analysis of cities. To resolve this problem, the [OECD](#) and the European Commission has developed a new definition of a city and its commuting zone in 2011. This new definition works in four basic steps and is based on the presence of an 'urban centre' a new spatial concept based on high-density population grid cells. Source: Dijkstra, L. and Poelman, L. (2015), *European Cities – Functional Urban Area Definition*, European Commission, DG Regio.

- Step 1: All grid cells with a density of more than 1 500 inhabitants per km² are selected.
- Step 2: The contiguous^[1] high-density cells are then clustered, gaps^[2] are filled and only the clusters with a minimum population of 50 000 inhabitants (Map 1.2) are kept as an 'urban centre'.
- Step 3: All the municipalities (local administrative units level 2 (or [LAU2](#)) with at least half their population inside the urban center, are selected as candidates to become part of the city (Map 1.3).
- Step 4: The city is defined ensuring that 1) there is a link to the political level, 2) that at least 50 % of the city population lives in an urban center and 3) that at least 75 % of the population of the urban center lives in a city (Map 1.4)^[3]

In most cases, as for example in Graz, the last step is not necessary as the city consists of a single municipality, that covers the entire urban center and the vast majority of the city residents live in that urban center. This is the usual case in Europe but not so in Ireland where the position in Drogheda, Waterford, Athlone or Carlow, together with other growing Irish settlements, are increasingly expanding over two or more counties, for which traditional governance implementation with the old-fashioned county system of local administration is no longer suited.

Here, the provisions of the radical reform policy of Putting People First (2014) will assist in overcoming the Louth-Meath boundary conundrum if an appropriate multi-county administrative system for local government is devised. The full 110 square kilometer matrix is set out in Appendix 4. At the merging interface of Drogheda-LBM, the specific example of this urban fusion, comprising the twenty-four square kilometre-area where Drogheda is agglomerating with LBM, the Harmonised OECD/ E.U. test of cell clusters is applied. The author's analysis is articulated in the next section, 8.

<u>Drogheda (part)</u>				<u>Laytown-Bettystown-Mornington (part)</u>	
823	5	46	112	275	1,059
2,411	2,470	673	752	748	691
435	861	56	13	1,224	2,162
45	13	106	11	90	705

The related issue of density is especially significant in sparsely-populated countries or regions where the emergence of agglomeration is infrequent or indeed, where the concept of urban agglomeration is counter-cultural. A country that is apathetic to the development of its cities is unlikely to be focused on density, urban agglomeration or perhaps even to matrix-clustering. Asia, with its burgeoning mega-cities, not least that of Japan, stands in sharp contrast with Ireland's temperate climate, yet handicapped with its tundra density of population and the ensuing dis-economies of scale.

8. Analysis of Population Grid Data:

In this case, the core cell clusters of 2,470 and 2,162 are at one-remove from each other with respect to their surrounding 8-cell positioning, *vide* Dijkstra and Poelman (2015). On that basis, Drogheda+LBM in the population data of 2011 would appear to fail the second-step requirement for the four-rule contiguity. However, should that particular population cell of 1,224 in that same census of 2011 grow to equal or exceed 1,500 in a future (e.g. in 2016 or a subsequent census), then the EU Harmonisation criterion would have been met. This would mean that the 18.4% shortfall of 2011 in that particular cell's population, would then have to be made good and depending upon the extent of that cell's share of the growth that has occurred during 2011-2016 in this fast-growing St Mary's Electoral District.

So, this leads on to the principal confrontational issues of this Paper: of the NSS (2002-2020) being replaced by NPF: When will it happen? What format will it take? Will it address the Irish Urban vs. Rural dilemmas? Will there be a provincial-city focus for growth to counterbalance Dublin? Otherwise, what is to prevent Dublin emerging as Ireland's 21st century citystate, *vide* Hughes (2010) PhD?

Focusing on the sustainability of Balanced Regional Development (BRD), as set out in Appendix 1 for its 8-point definition, those who still support BRD are strongly reluctant to accept radical change despite the overwhelming evidence of the old spatial policy's contribution to one-off housing, to rural and small town proliferation and to city/ urban dilution? Likewise is the need to link that policy's failure and to take responsibility for its dismal demographic growth-outcome for so many of its 23-nominated Gateways and Hubs.

Thus, as an initiative to support the recognition of Ireland's sixth (or is it fifth in size?) I will 'christen' Drogheda-LBM as 'Whitaker' city in honour of its august, past resident (1916-2017).

9. Applications for Urban Economic and New Economic Geography theory:

This section is Urban Economic in theme. Japan's most celebrated international urban economist Masahisa Fujita notes that the nineteenth century German Landowner Johann Heinrich Von Thünen in his pioneering work, has provided the foundation of both Urban Economics and the new economic geography (NEG). In Fujita's opinion, Von Thünen's (1826) thinking on industrial agglomeration was not only amazingly advanced for that time, but in many respects remains novel even today. Fujita uses the Von Thünen (1826) bid rent model as was transformed by William Alonso (1960, 1966) to further his own work on the urban sphere. Furthermore, Fujita showed *...that if Thünen's well-known theory on agricultural land use is unified with Fujita et al.'s pioneering work on industrial agglomeration by using modern tools, then we achieve a prototype of the New Economic Geography model.*

What are these modern tools? Even for non-math readers, Fujita's literature on cities is surprisingly accessible, viz. the fulsome and descriptive text of his *Urban Economic Theory – Land Use and City Size* (2003), Cambridge University Press. This provides *...an examination of the economic reasons determining choice of location. It develops, through analysis of the bid rent function, a unified theory of urban land use and city size.*

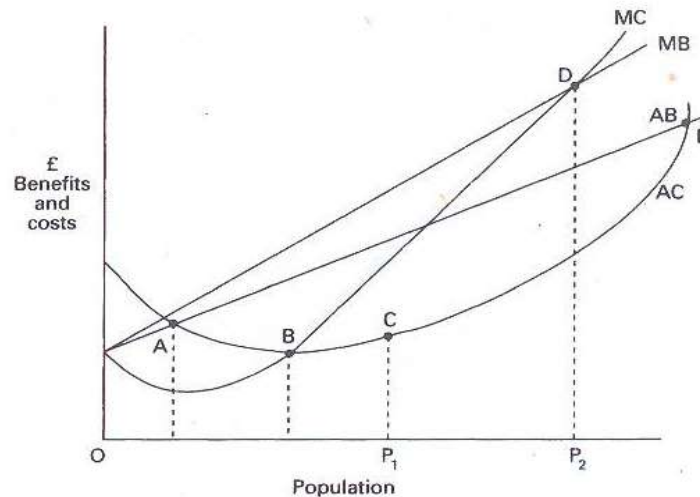
In summary, the modern-day Japanese giant is Fujita who together with Krugman and Venables (*The Spatial Economy*, 2001, MIT Press), and likewise, in Fujita and Thisse (*The Economics of Agglomeration*, 2013, Cambridge) – have produced this body of pioneering work - which has contributed to unifying the new urban economics with the new economic geography, and in doing so has illuminated our understanding and beneficial use of these disciplines, vide, Appendix 3.

10. Urban Agglomeration and Demography - the drivers and location for future growth:

In her 1969 Appendix, Jacobs demonstrated diagrammatically how and why specialised economic concentration occurs in cities. Her five-stage set of diagrams show:

- The Simple Export-Generating Process
- The Import-Replacement Process
- Export Generation into Large Cities
- The Two-Reciprocating Systems, (for simple and subsequent cycles) and
- Correlation of these four stages with conclusions as to the nature and change of 'work' which Jacobs foresaw, as becoming increasingly cerebral and services-orientated.

It is useful to cite some of the major players, dates and their principal contributions, resulting from Von Thunen's above-described Urban Economic foundation of 1826. Then William Alonso in his Paper to the Regional Science Association (1971) explained his five inflection points – Costs and Benefits of City-Size, in his graphical portrayal of population size, plotted against Average and Marginal Costs and Benefits. This 1971 context was primarily based on an industrial-manufacturing city as contrasted with the 'knowledge economy' one of present-day. This overall perspective is shown as follows with Inflection Point D reflecting the optimum city size for current citizens and Point E is the optimum perspective of in-migrants:



Alonso (1971): MB = Marginal Benefits; MC = Marginal Costs; AB = Average Benefits; AC = Average Costs.

This was followed by J. Vernon Henderson's explorative works, commencing in 1974 on urban economics and geography, *The effects of Urban Concentration on Economic Growth* (2000). The continuity of city rank-size and the 40-year monitoring of world cities, which together with Wang, H.G. (2007), is confirmation of the (1949) Rank Size Rule of Zipf. Likewise, the Alonso (1971) descriptor for his Point 'A' as representing a city of 100,000, the start point for minimum threshold size, was influenced by *Central Places in Southern Germany*, Christaller, W (1933) as modified by Losch, A. *Economics of Location* (1954) with its Land Use and Transport Interface of city rank size, with due allowance for accessibility.

Fujita's Land Use and City Size work on housing lot size and population density changes within a city (1989) clarified the issue of residential equilibrium within a monocentric city. In turn, this raises a further issue – one that is driven by the fundamentals of the new economic geography. Ireland's recent demographic history proves that specialisation and the location of economic activity cannot be spread or resourced in a way that is envisaged by Balanced Regional Development. Such activity increasingly is spatially clustered, vide Appendix 5.

The scene-setting quotation taken from Fujita and Thisse is very clear ...*Economic activities are not concentrated on the head of a pin, nor are they spread evenly over a featureless plain. On the contrary, they are distributed very unequally across locations, regions and countries, generating contour lines that vary with time and place.* P.1, Fujita and Thisse (2013).

Likewise future population spread will be increasingly 'lumpy' as propounded by the World Bank's *World Development Report* (2009): *Reshaping Economic Geography*. This viable alternative to BRD is the centripetally driven core-periphery model, as described by the treble chain-stages of Krugman's NEG Nobel-winnings research findings and publication (years) as follows:

- **Increasing Returns and Intra-Industry Trade (1979)**, leading to
- **Increasing Returns and Transport Costs (1980)**, and then incorporating
- **Transport Costs and Interregional Labour Mobility (1991)**,

also predicated on reduced transport costs and assuming the availability of skilled labour. The choice is stark: Full agglomeration or perfect spread, as set out in the Regional Studies Association's *Spatial Economic Analysis*, Vol.4, No. 1, P.19. Brakman and Garretsen (2009), *The Tomahawk Bifurcation* from the Krugman Model (1991).

Given the circumstances of Ireland as a progressive western economy, with its proclivity for short-termed political horizons and its preoccupation with resolving local issues and on current expenditure rather than on some element of capital investment, this inevitably capital-spend contraction becomes the norm, despite its mandatory urban economic imperative for securing future growth. With Ireland's current economic recovery there is some 'early growth' evidence for the east, primarily GDA, but much more is required for achieving an all-region set of results for the following objectives:

- **Sustained investment in infrastructural improvement**
- **A positive land-use/ transportation interface with long-term goals**
- **City densification and increased building heights**
- **Monocentric morphologies as opposed to Polycentric spread of commuter belt**
- **Leading to reduced home-to-work, schools and college-journeys**
- **Edge-city policy and land management**
- **The focus on arresting the proliferation of rural one-off housing**
- **Co-ordinated transportation projects such as Dublin's Eastern By-pass and Metro North**
- **Improved competitiveness linked to supply of affordable accommodation**

Much work remains outstanding in the application of demography to the NEG literature. For instance as it was only in 2015 that the European Union agreed to adopted a unifying approach to the measurement and definition of the 'city' and as shown: how this population density, one-kilometre grid, approach called the 'Graz Model', is applied by this writer in identifying Ireland's newest, yet to be confirmed, city at Drogheda-LBM. In contrast to this, the mistaken focus in 2011 was to concentrate on the 100-metre rule, to divide off and separate Bearna from Galway and Balrothery from Balbriggan, in an attempt to underplay the impressive 2006-2011 growth of these two large settlements.

Ireland has an underdeveloped and scattered settlement structure. The emerging realisation is that modern industry and business services will see further clustering in specific urban locations because face-to-face relationships matter. The concept of 'cottage industry' remains an idealistic hope that hasn't happened and given the slowness in Irish rural broadband roll-out, the time frame is pushed back into the next decade and with RoI Broadband reaching just one-million homes to-date.

The Irish Housing supply crisis and related national competitiveness issues of rent and house-price affordability largely arises in part, to the continuing over-concentration on building one-off rural housing and to a less than effective management of the existing housing stock. Instead, there is a need to address the potential for urban densification, the recycling of brown-field sites and to construction output matching locational-demand for housing. And thus the current mismatch of housing shortages with the need for demographic concentration and settlement-size growth remains a major stumbling block for the Irish economic and its competitiveness ambitions.

Focusing on city-specific examples of good practice – at all times driven by solid evidence base and on proven urban economic theory - there is a huge dilemma for Irish Government, maintaining fiscal balances for capital and/ or current expenditure? One example of good practice is the current debate on legislative provisions for an elected Mayor for Dublin. City governance and International promotion are interlinked, as constantly articulated by Dublin City Council.

Looking to the future with optimism, one of Ireland's 'Fifth Cavalry' rescuers has been The European Investment Bank's (EIB) in its recent role in Ireland's financial bailout. Increasingly it may also have an expanded resource role, as potential funder of choice for much-needed capital infrastructure. The question is: can sources such as the EIB be used as a substitute for direct Government funding for capital purposes in off-balance sheet ways? This, for Ireland continues to be an important issue because for the foreseeable future, most taxation revenues are likely to be used to fund current spending including public-sector pensions. Dependable sources of capital investment are predicated by the need for all capital investment propositions to be stress-tested for viability.

11. Some major issues for Ireland's cities:

So what are the major issues and objectives for Ireland's cities and larger settlements:

To improving their environment: Brown-field vs. green field development. For Ireland: the emergence of the Strategic Development Zone concept – there are just ten of them as of today. Their benefit - of direct grant of Planning Permission by An Bord Pleanala (the Irish Planning Board).

Best use of natural environment: Our visitors will be able to sample Dublin's superb geographical appointment, the bay, the mountains, its centrality and accessibility. The physical endowment of proximity to sea, access to the rural environment, its temperate climate.

Commuting and the sustainability of satellite towns: The Alonso/ von Thunen value/ distance relationship critical to Ireland's competitiveness - driven by property values, both commercial and residential. The Hall-Pain (2006), *The Polycentric Metropolis* findings of North-west European city-regions regarding Dublin's excessive mono-centricity.

Centripetal agglomeration: The need for further densification and use of brown-field sites – 2016 Census evidence for the five Irish cities and a sixth potential one.

Growth elsewhere – other settlements: If not in provincial cities, where will future growth be expected to occur? Limitations on future agricultural output with climate change penalties for methane? The food industry: – its ability to diversify? Limitations for agriculture production, due to bovine-generated methane gas constraints.

Reduced home/work commuting: Residential locations must empathise with employment location.

Intensive recycling of brown-field sites: Uses of existing Utilities, Infrastructure and Social Goods – schools, etc. The importance of Urban Design to add value to urban renewal on a human scale.

12. Presentation of theories/methods and Conclusions:

This Paper concludes with a brief citation of related theories, methods, their limitations and conclusions, thus:

Theories: The Von Thunen-Alonso Value-Distance foundation of Urban Economic theory; The application of Central Place Theory, Christaller, 1933 and its transportation variation, Losch, 1944, in discerning viable urban growth centres; the application of Zipf's Law; Alonso's Value to Distance trade-off; the now-standardised EU Matrix Harmonisation measure (the Graz model) 2015 and its demographic model that informs the emergence of RoI's sixth city - Drogheda-LBM.

Methods: Demographic Analysis, emerging cities Drogheda – 2016 population to be confirmed, as complying with the 2015 EUH criteria, combining Theories and Methods.

Limitations: Whereas sound theory is based on life experience, today's uncertainties include the BREXIT outcome and Trump election! The prospect of changing Trade patterns, The extent of flexibility and cohesion of the future EU? National legacies of High State Debt/ GDP ratio; Making hard choices between future further Current and reduced Capital Spending; Prospects of increasing inflation and rising interest rates.

If there is belated political recognition then there will be more positive emphasis on the opportunities to grow our cities. The potential for our provincial cities to contribute to overall economic growth has remained largely unexploited in Ireland's spatial policy strategy to date. Buchanan was rejected in 1970 and the National Spatial Plan of 2002 was fundamentally anti-city despite its empty rhetoric. Therefore the forthcoming National Planning Framework will provide the opportunity to rectify past policy weaknesses so as to provide new directions for top-down city-led growth to the regions. In doing this Irish policy-makers and politicians may contribute to reversing the decline in rural areas.

On their own, bottom-up attempts to arrest this decline, have been both unrealistic and largely unsuccessful. They have been based on futile balanced regional development idealisms, devoid of economic or financial direction. Whereas one is not dismissive of effective bottom-up initiatives, increasingly top-down concentrations of 'lumpiness' are the way forward as heralded by the World Bank (2009), if they are focused on city-led initiatives, evidence-based on the compelling theories of urban economics and of the new economic geography (NEG).

Alongside this is the need to devise a positive, yet careful EU approach to European and world migration which needs to be addressed in ways that accommodates refugees and economic migrants without unduly disrupting the economies and populations of recipient countries in the first world. Whilst recognising the evidence of urban overdevelopment, Japan is proof positive of the benefits that derive from fostering urban agglomeration and in availing of the economies that arise from urban densification and for urban technology. This for Ireland must also be the desired spatial policy approach.

Ireland's considerable potential for growth arises from a number of attributes, recognising its uniquely low density of population and educational attainment, albeit significantly handicapped by

the absence of sizeable cities. We have pointed to Ireland's positive demographic trend despite the economic collapse of the first decade of this new millennium and to unavoidable austerity impositions. This paper is premised on 'optimism'; the by-word of Ireland's man of the 20th Century, T.K. Whitaker. The Republic of Ireland, hopefully, can and will remain as a committed member of the European Union as its principal and only English-speaking nation.

This paper also recognises the geographic opportunities resulting from Ireland's unique international location – within the east/ west UK to US and Canadian economic sphere of the world's major English speaking nations. As to the possibility of RoI's National Planning Framework espousal of a policy for Irish city-growth, its authors should heed Fujita et al. (2001, 31) ...*The interaction between economies of scale and endogenous market size can lead to a cumulative process of agglomeration.* Earlier, Kaldor (1940) in what is known as Kaldor Improvements had found that ... *Agglomeration with compensation from core to periphery can make both regions better off when trade costs are sufficiently low.* This provides a strong message for scale economics and freeness of trade.

Given the medium-term uncertainties facing both Ireland's economy, the legacy of its financial debt and the need for a radical change in its spatial strategy, there is the need to provide a political leadership that is able to recognise past policy errors so as to avoid repeating the same mistakes out to 2040. Ireland must therefore plan for what is likely to succeed rather than continuing to strive for what is certain to fail. This requires an acute understanding of Demographic Trends, of Urbanisation, Densification, Agglomeration and Lumpiness which must replace the unattainable myth of 'balance'.

Thus the leadership, to both cherish and recognise the potential of Ireland's cities – with their spatial and economic policy opportunities – so as to deploy related theories and techniques that have developed world-wide, not least those of Japanese urban scholars, not least those pioneering Urban Economic achievements of Masahisa Fujita.

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Appendix 1

The Eight Key Concepts of Balanced Regional Development in the 2002-2020 NSS

- The key concepts (of the NSS) are potential, critical mass, gateways, hubs, complementary roles and linkages.
- Potential is the capacity that an area possesses, or could in future possess, for development, arising from its endowment of natural resources, population, labour, its economic and social capital, infrastructure and its location relative to markets.
- Critical mass relates to size and concentration of population that enables a range of services and facilities to be supported. This in turn can attract and support higher levels of economic activity and improved quality of life.
- Gateways have a strategic location, nationally and relative to their surrounding areas, and provide national scale social, economic infrastructure and support services. Further development of the five existing gateways at Dublin, Cork, Limerick/ Shannon, Galway and Waterford is a key component of the NSS.
- In addition, a small number of other large towns, which have the potential capacity to become gateways and lead development in their regions, will play a key role in achieving a more balanced role in regional development.
- Hubs: A number of towns will act as hubs, supporting the national and international role of the gateways and in turn energising smaller towns and rural areas within their sphere of influence.
- Complementary roles for other towns, villages and rural areas; various medium-sized towns in each region will act as 'local capitals' providing a range of services and opportunities for employment. Within the spatial framework provided by the NSS, rural potential will draw upon local economic strengths, supported by a stronger structure of smaller towns and villages as a focus for economic and social activity and residential development.
- Linkages in terms of good transport, communications and energy networks are vitally important to enable places and areas to play to their strengths.

Source: The National Spatial Strategy (2002-2020: 12)

A Note on Ireland's Political Decision-Making: The recent negotiations between Ireland's two main political parties, regarding the extent to which rent control should apply to urban areas, provided interesting insights as to why 'scientific' evidence and research should be allowed to outweigh the 'political' reasons for making such decisions. In a similar manner, scientific research should be applied when the selection of growth centres considered by the Government for the forthcoming National Planning Framework.

Nowhere in this heated and controversial debate, to date, has there been evidence from like-minded Irish politicians of appreciating the spill-over effects that cities play in benefiting their regional spheres-of-influence. Neither do they appear to understanding the top-down endowments that are central to the core-peripheral growth

of successful city regions which underwrite the dynamics of urban economics, of central place theory and of the new economic geography findings which underscored Paul Krugman's Nobel Prize award for economics achievements of 2008.

Balanced Regional Development as a spatial and economic policy has singularly failed to acknowledge why cities exist and the urban agglomeration reason for their growth. Ireland's demographics confirm that it has encouraged the proliferation of one-off housing, small towns and villages to the detriment of city concentration and growth-centre formation, advocated by The World Bank in 2009.

Likewise, there has been a critical political failure to acknowledge that rural living and their associated sparse populations imply enormous costs to the State, the Private Sector and to the taxpayer of the inordinate costs in maintaining services: to unviable branch banking and post offices, rural one and two-classroom schools, 'scattergun' broadband provision, garda stations, the ambulance service, GP practices as well as the upkeep of the inordinate length of Ireland's rural road structure. It has also reinforced Ireland's political system in perpetuating 'clientalistic' parliamentary politics at the expense and neglect of pressing policy formation and legislation enactment.

Given the five-fold or €160 Billion *increase* in the State's National Debt over the past decade as well as private citizens' debt burdens and likewise of their long-term cost of servicing, Ireland now needs to focus its increasingly limited resource of current and fixed capital expenditure into a few centres for growth rather than in continuing to practice 'Balanced Regional Development' with its implicit, failed 'one for everyone in the audience' approach. Instead, future policy formulation will have to foster Specialisation and long-run location of activity that fuses the Fujita and Krugman approaches to Trade Theory with Economic Geography.

Specifically, there is an urgent need to reduce the ever-widening population disparity between Dublin's 1.17 million population compared with just 110,000, the average size of the State's four provincial cities. In turn, such substantially-enlarged cities would provide the necessary gravity mass of 'lumpiness' and would then be in a much better position to benefit their regions and to then become the dynamic cores to create enhanced employment and rectify the demographic imbalances that currently prevail outside of the Greater Dublin Area.

The standing down of the 2002-2020 National Spatial Strategy was primarily due to its inappropriate core policy of *Balanced Regional Development* when applied to a sparsely populated country. We need to continuously remind our politicians of their past calamitous decision-making including their rejection of the principal recommendations of the Buchanan Report for city growth in 1969 and the 2003 debacle for 'scattergun' Public Sector Decentralisation.

APPENDIX 2

Apropos this Paper's reference to Ireland's recent population dynamics. Shown below are the contrasting Regional performances of both the Census populations (2011 and 2016 (Preliminary)) together with the varying regional contributions to growth for that five-year period to April 2016.

Table: Irish Planning Regions - Population Growth, 2011-2016

	Census 2011	Census 2016 (Prel.)	Population Growth	% regional population growth rate	Population Growth % contribution
Dublin	1,273,069	1,345,402	72,333	5.68%	42.62%
Mid East	531,087	559,404	28,317	5.33%	16.68%
Midlands	282,410	291,941	9,531	3.37%	5.62%
South East	497,578	511,070	13,492	2.71%	7.95%
East Border area	<u>256,563</u>	<u>265,740</u>	<u>9,177</u>	<u>3.58%</u>	<u>5.41%</u>
East of State	2,840,707	2,973,557	132,850	4.68%	78.27%
South West	664,534	689,750	25,216	3.79%	14.86%
Mid-West	379,327	385,172	5,845	1.54%	3.44%
West	445,356	453,413	8,057	1.81%	4.75%
West Border area	<u>258,328</u>	<u>256,084</u>	<u>-2,244</u>	<u>-0.87%</u>	<u>-1.32%</u>
West of State	1,747,545	1,784,419	36,874	2.11%	21.73%
State	4,588,252	4,757,976	169,724	3.70%	100.00%

Source: Brian Hughes analysis of CSO 2011 Census and 2016 CSO Preliminary Census data.

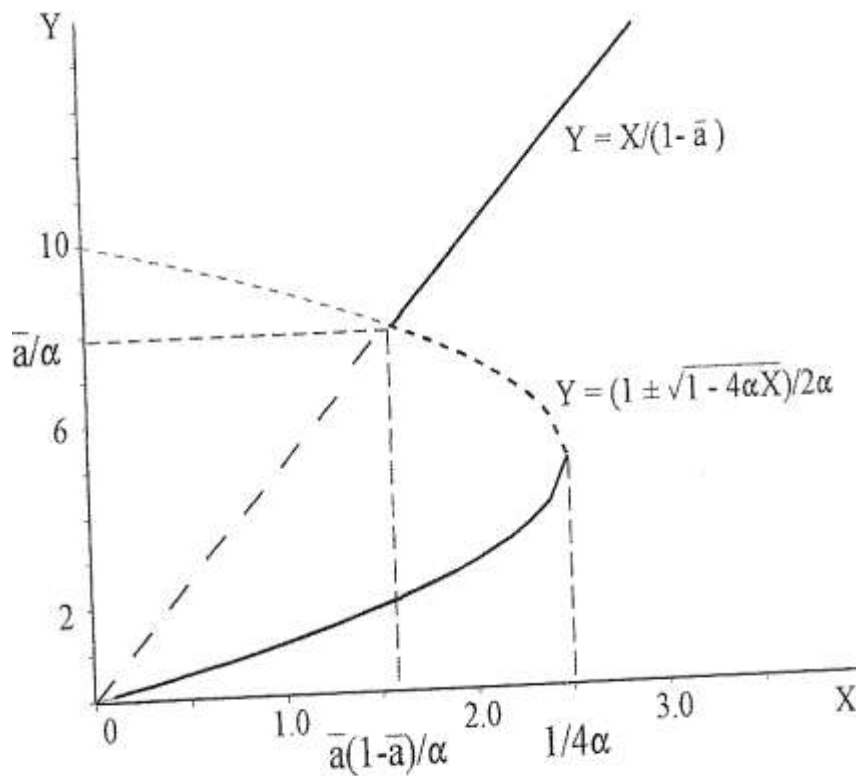
Note: East Border includes Louth, Cavan and Monaghan: West Border comprises Donegal, Sligo and Leitrim.

The corresponding all-Border Region figures are: 514,891, 521,824, 6,933, 1.35% and 4.08%, respectively.

During 2011-2016 the Greater Dublin Area alone, comprising the Dublin and Mid East regions, contributed 59.30% of the total State growth. Of note in the above data, is the contrasting east-west performance to State population growth; 78.27% versus 21.73%. The 2016 census also confirms a return to net in-migration and thus previous intercensal growth rates can be expected to resume. For instance, in 2002-2006 the State population grew by 322,645 (+8.26%) and during 2006-2011 it was up by a further 348,404 (+8.22%). Thus, in the nine years to April 2011, the State population grew by 671,049 (+17.13%) above the 2002 level, as confirmed in these twenty-first century censuses.

Appendix 3

Figure 7.2: Equilibria in the Base Multiplier Model of Fujita *et al.* (2001: 29)



In this quadratic-based equation model approach to depicting a growth-shift stimulation, it is noted that after the 'break point', equating to 1.6 on the 'X'-axis is reached, then the former sedate slope of the settlement's growth curve below that point, is followed by a leveraged and sudden 'jump' from 2 to 8 on the 'Y'-axis, its 'multiplier' effect. Following that burst of growth, a significantly steeper growth progression ensues; as depicted by the forty-five degree angle of the post-bifurcation event, as shown by the thick black line, occurring after the 'sustain point' is reached.

In turn, this theory adds support to explain Dublin's current emergence of economic buoyancy, coming on top of that settlement's unexpected, near-65,000 population increase (2006-2011) and even larger one of 72,300 (2011-2016). If this is the case, is it then possible to envisage for the future, a replication of such a multiplier 'shift' outcome for other cities – but most realistically for Cork, in developing Ireland's 'missing' hierarchical tier of 200,000 to 500,000 in settlement size?

Appendix 4

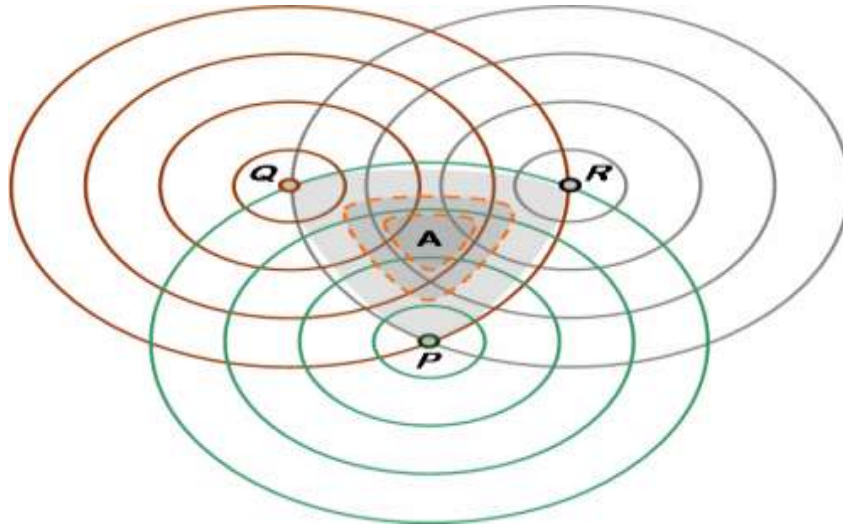
The complete matrix for the twin settlement of Drogheda and LBM confirms a grid formation in a north-south depth of ten kilometre rows. The respective core populations are set out in an 'all-border' format, comprising fourteen medium-density central grids totalling 11,297 in population for LBM, located east of and next to the twenty grids totalling 37,669 for Drogheda. In all, these adjoining 34 sq. km. grids comprise a **core** agglomeration population of 48,996 with an average density of 1,440 people per sq. km., set out as follows:

Drogheda-LBM 2011 census Population Spread – OSI Map Grid References:

Grid cells	<u>6/7</u>	<u>7/8</u>	<u>8/9</u>	<u>9/10</u>	<u>10/11</u>	<u>11/12</u>	<u>12/13</u>	<u>13/14</u>	<u>14/15</u>	<u>15/16</u>	<u>16/17</u>	<u>Totals</u>
79/80	131	54	86	9	28	107	58	97	40	37	-	647
78/79	26	6	27	59	58	84	52	83	5	-	-	400
77/78	20	17	61	16	449	153	79	65	99	-	-	959
76/77	74	219	2,643	3,308	2,423	10	5	80	489	306	-	9,557
75/76	1,212	1,534	3,226	3,553	823	5	46	112	275	1,059	-	11,845
74/75	1,028	3,631	3,183	2,727	2,411	2,470	673	752	748	691	-	18,314
73/74	73	553	494	705	435	861	56	13	1,224	2,162	185	6,761
72/73	42	20	80	62	45	13	106	11	90	705	392	1,566
71/72	5	25	87	-	85	5	15	20	35	443	1,378	2,098
70/71	51	25	5	61	76	43	52	253	223	21	8	818

APPENDIX 5

Figure 3: Urban Clusters



After: [Strange](#) (2005)

A principal weakness of this NSS proposal for the midlands ATM gateway, is the absence of a nucleus as 'A' in the figure above, and for existing settlements or their size, there is little to indicate or encourage where development might take place. Mullingar's 'R' location is preferable in terms of Dublin's Sol proximity as is evidenced in its more rapid population growth. However, it has little current commercial or development activity, Curran (2008). It is uncertain how settlement spatial clustering could occur in the absence of a sizeable nucleus – where 'A' might represent, geographically, the towns of Clara with a population of 3,001 or perhaps even Moate having 1,888 people in the 2006 census - especially in a very low-density agricultural setting, with modest levels of industrial development activity and in an absence of tertiary-level agglomeration.

Walsh, in Bartley and Kitchin (eds) (2007: 52), whilst not specifically defining UA, articulates Dublin's critical mass in the context of local and regional potential, thus:

It has been defined as the size, concentration and characteristics of populations that enable a range of services and facilities to be supported and which, in turn, can attract and support higher levels of economic activity. The transformation that has occurred in Dublin since the early 1990s illustrates the importance of critical mass. Dublin's success has been assisted by its population size and structure, level of education, the availability of educational resources, the mix and clustering of different types of labour pools in niche sectors, transport links to other regions and countries, the informal network of people and expertise that provide the scale of critical mass to support rapid economic progress.

