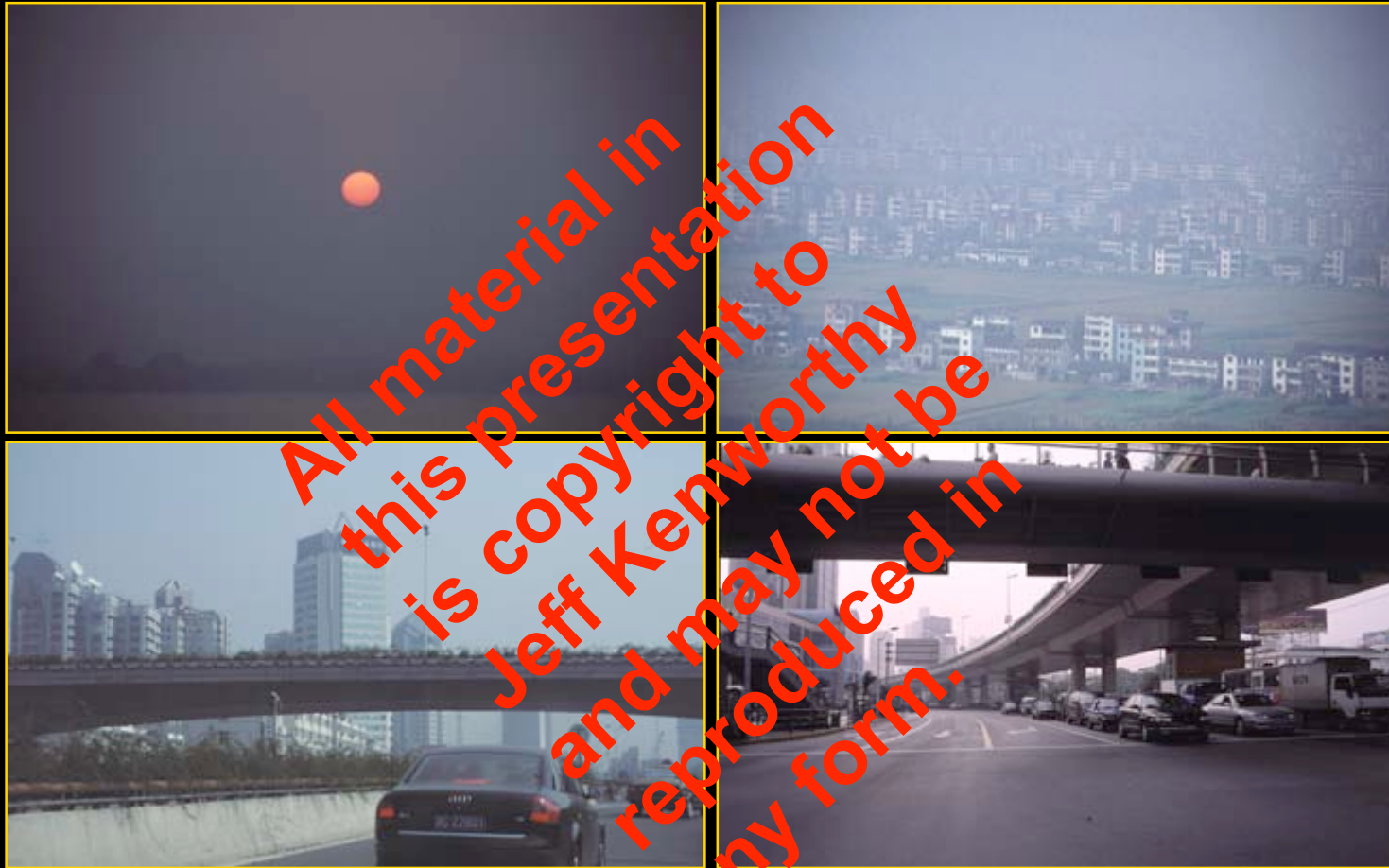


A Key to Urban Sustainability: Overcoming Automobile Dependence

Shanghai and Hangzhou, China



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OUTLINE

Nexus between transport and urban form is at the heart of overcoming automobile dependence.

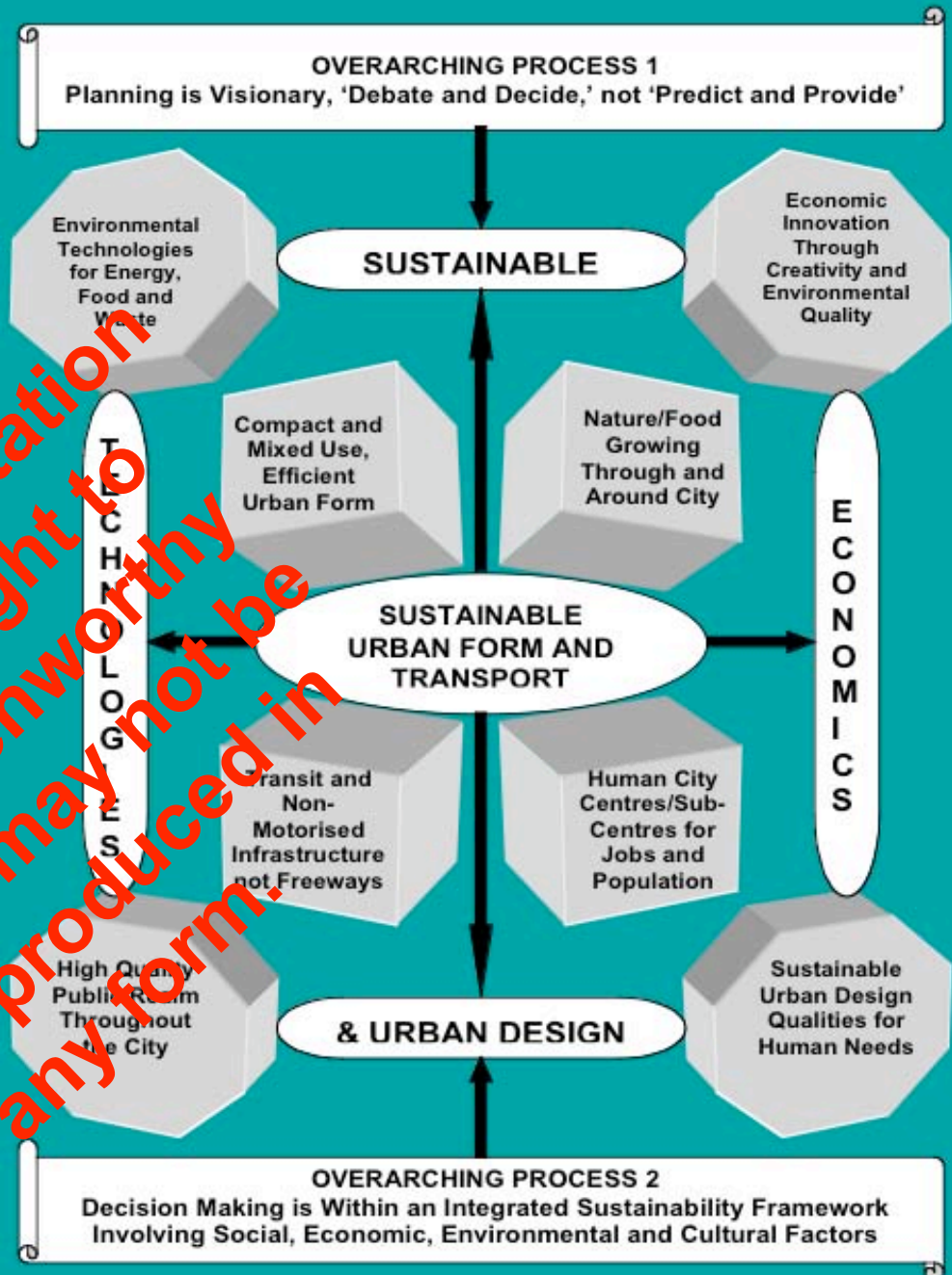
This is the basic core framework around which most other factors must be embedded and must operate. Sustainable urban form and transport depend on:

- (1) Compact, mixed use development
- (2) Human-oriented city centres and sub-centres with minimum density levels
- (3) Priority to supplying superior public transport and non-motorised mode facilities, not more large roads
- (4) Protection of natural areas and food production potential in cities

Around this core set of factors revolves a constellation of four other essential factors: sustainable technologies for water, waste, energy etc, sustainable economic development, sustainable urban design and creation of a high quality public realm.

Two key processes for decision-making overarch all of this.

Reference: Kenworthy, J. (2006) The eco-city: ten transport and planning dimensions for sustainable city development. *Environment and Urbanization* 18 (1) 67-85.



(1) Compact, Mixed Use and Efficient Urban Form

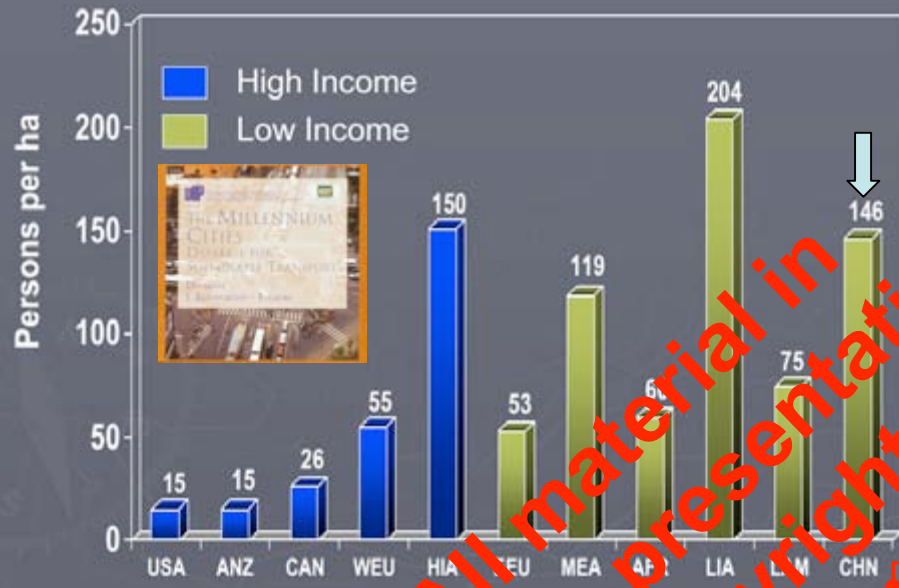


Faceless car-dependent suburban sprawl eating up valuable food producing land, is at the heart of unsustainable urban development, like here on the outskirts of Hangzhou.

Compact, mixed use, transit-oriented communities with a sense of place and identity are needed for overcoming automobile dependence, such as in Leiden, The Netherlands.

Higher density communities with mixed land use are needed, not more destructive urban sprawl and they need to be transit-oriented developments (TOD), built around high quality transit systems.

Urban Density in World Cities, 1995



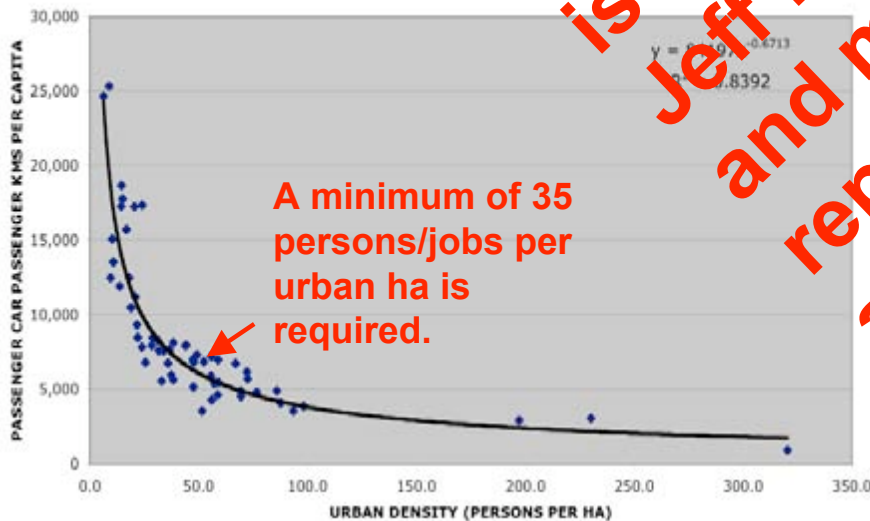
Urban density is critical to sustainable transport and how we achieve higher densities will largely determine how sustainable and livable the city will be.

The key is to develop compact town centres, neighbourhood centres and other urban developments that are walkable and transit-oriented.

Car Use per Capita in World Cities, 1995



URBAN DENSITY VERSUS PRIVATE CAR TRAVEL IN HIGH INCOME CITIES



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Close integration of housing/mixed use development around rail and trolley bus in an urban village in Zurich.



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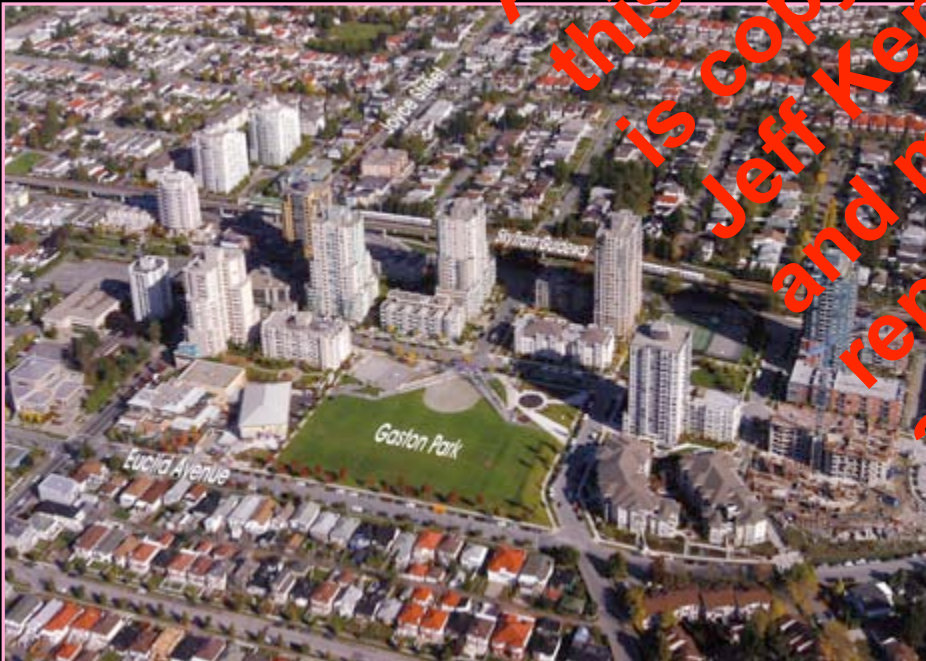
False Creek, Vancouver: A traffic-free community of over 20,000 people built where freeways would have been. Freeways scrapped! Chinese cities need to consider this approach to urban development by minimising freeways and maximising ecological, auto-free urban development.



Joyce Station,
Vancouver, 1987



Joyce Station,
Vancouver, 2004



Rail can be very powerful in influencing the form and scale of development



Skytrain

New Westminster Station
Vancouver, 2004



A range of housing densities
that are people-oriented



Generous, people-oriented public
environments



Hotel, Offices, Farmers Market,
Cafes, Restaurants

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(2) Transit and Non-Motorised Infrastructure, not Freeways



Freeways destroy the sustainability of cities, do not reduce congestion and promote greater car use. Chinese cities are building freeways/tollways at an alarming rate.

Freeways are not a necessity in any city. They are policy driven.

The City of Vancouver never built any and has become one of the most livable, attractive cities in the world.

Infrastructure for transit, walking and cycling promotes sustainability.

Length of Freeway per Capita in World Cities, 1995

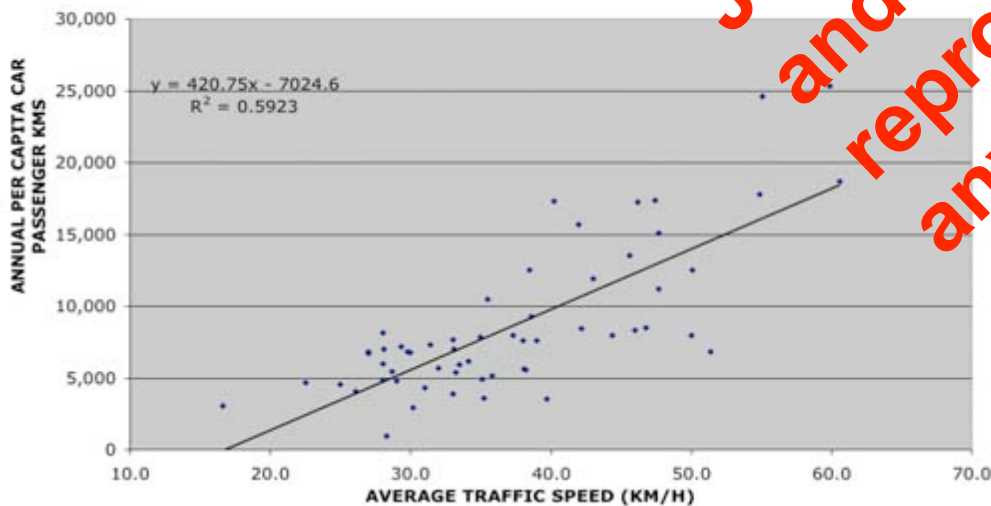


Higher congestion is strongly associated with less use of cars in a city.

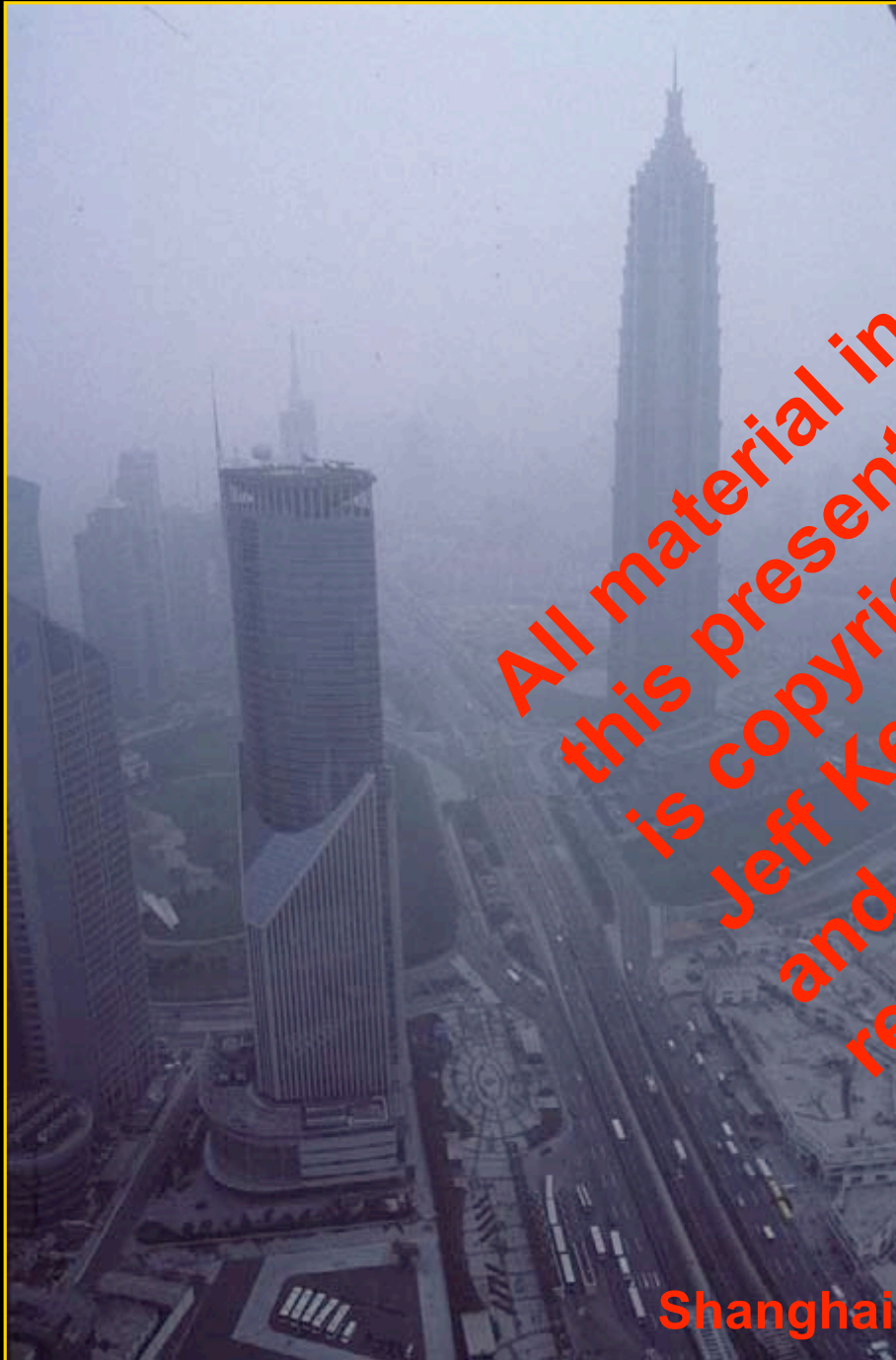
Congestion appears to act as a brake on automobile dependence.

As average speed of cars increases so does car use.

AVERAGE ROAD TRAFFIC SPEED VERSUS PER CAPITA CAR USE



As congestion rises, car use diminishes. Trying to remove congestion through freeway building pushes cities towards greater car use.



Shanghai



Denver

Freeways and parking have negative environmental and social effects on the human qualities of cities through their space consumption.



Salzburg

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Geneva



Salzburg



Portland

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Cities that do not prioritise congestion reduction and parking develop better transit systems and enhance their human qualities.



Freiburg



Kunming



Vienna



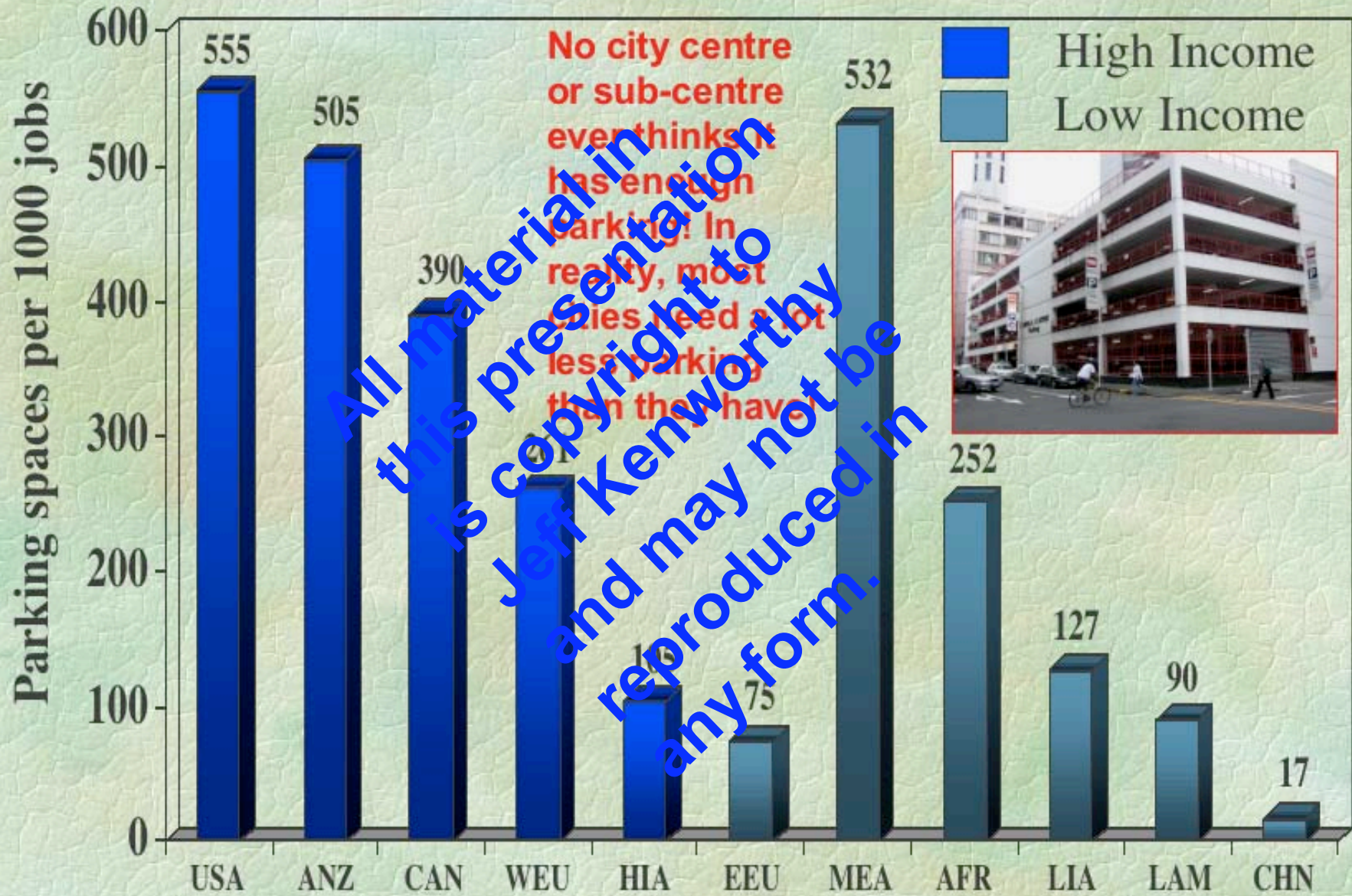
Dublin

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Reserved rights-of-way are critical for transit. Transit, walking and cycling can compete with cars when given priority. Light Rail Transit systems can also green the city as in Freiburg (top left).

Parking Spaces per 1000 CBD jobs in World Cities

1995



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Excessive emphasis on parking destroys the urban design qualities of places by sterilizing vast areas and making the environment hostile to pedestrians and cyclists.



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Percentage of Total Daily Trips by Walking and Cycling (NMM) in World Cities 1995





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Small cities like Groningen (Netherlands), Erlangen (Germany) and larger cities like Kunming (China) have prioritised bikes (and walking) and achieved over 50% of daily trips by those modes.



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**Traffic calming of an inner city shopping street: Leipzigerstrasse, Frankfurt.
Traffic calming on a main road: Berlinerstrasse, Offenbach, Germany
(4 lanes reduced to 2 lanes) and pedestrian market area in Kunming.**

Overall Transport Sustainability of Chinese Cities in 1995 Based on 26 Indicators

- Urban density (persons/ha)
- Proportion of jobs in CBD (%)
- Metropolitan gross domestic product per capita (USD)
- Average user cost of a car trip (‰ per capita GDP/trip)
- Average user cost of a public transport trip (‰ per capita GDP/trip)
- Length of freeway per person (m/person)
- Parking spaces per 1000 CBD jobs
- Total length of reserved public transport routes per 1000 persons (m)
- Total length of reserved public transport routes per urban hectare (m)
- Total private passenger vehicles per 1000 persons (cars + motorcycles)
- Total public transport seat kilometres of service per capita
- Prop. of all daily trips by non-motorised modes (%)
- Prop. of all daily trips by public transport (%)
- Total car+motorcycle+taxi passenger kilometres per person
- Total public transport boardings per capita
- Total passenger transport cost as % of metropolitan GDP
- Total private+public passenger transport energy/person (MJ)
- Total CO2 emissions per person from passenger transport (kg)
- Total emissions of CO, HC, NOx and SO2 per capita (kg)
- Total emissions of CO, HC, NOx and SO2 per urban hectare (kg)
- Total transport deaths per 100,000 people
- Total transport deaths per billion passenger kilometres
- Prop. of total motorised passenger kilometres on pub. transport
- Ratio of public versus private transport speeds
- Ratio of annual investment in pub.trans versus priv. trans infrastructure
- Ratio of segregated public transport infrastructure versus freeways

Overall Sustainability Percentage Score



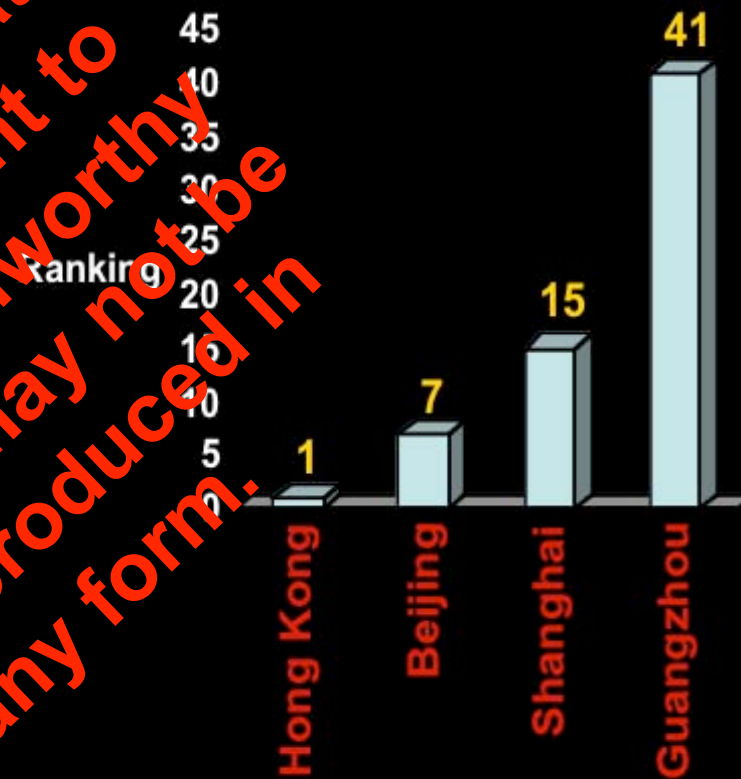
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Overall Transport Sustainability Ranking of Chinese Cities Out of 84 Cities in 1995, Based on 26 Indicators

- In Private Transport Performance **only**, based on 9 Indicators (congestion, trip distances and time required, costs and transport deaths) Shanghai, Guangzhou and Hong Kong rank very well in the Top 10 at 4th, 5th and 6th of the 84 cities in the world.

- In Public Transport Performance **only**, based on 6 Indicators, just Hong Kong ranks in the Top 10 at number 5.

- In Combined Performance of both Private and Public Transport, Hong Kong ranks number 2 in the world behind Tokyo and Shanghai ranks equal 6th with Zürich in Switzerland.



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(3) Nature and Food Growing Within and Around The City



Urban sprawl leaves no room to express nature in the city or to grow food. Food production and natural areas are pushed further away from the city.

Compact, transit-oriented development can be set in large natural areas and surrounded by forests. Food can be grown within and near the city.

Urban sprawl, roads and car parks destroy natural areas and land for agriculture and food production, compact planning helps to promote them.



Sprawling cities do not develop this close linkage between productive and natural land and urbanisation.

In Zürich and Helsinki green corridors weave their way between apartment buildings forming a network.

All developments are also linked to quality public transport.



Traffic calming with community gardens in Vancouver, BC



Urban village in Helsinki linked to the LRT system

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Amsterdam



Amsterdam



Zürich region



Stockholm



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Parts of the Amsterdam region incorporate intensive food growing within the urbanised area. Compact planning principles in much of Europe allow food growing and green space to permeate the urban region. Cities must become more self-sufficient in food in the post-petroleum age. Chinese cities have this tradition but are losing it.

Kunming



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Kunming and other Chinese cities traditionally have a close relationship between the city and the food growing areas. This link is being broken as the cities sprawl to accommodate the car. As global oil production is peaking and the energy cost built into food increases, this direction is very dangerous.

(4) Human City Centres and Sub-Centres for Jobs and Population



Freiburg, Germany



Kunming, China



Freiburg, Germany

The major centres in cities need to be less automobile dependent and more human in character to be successful and must achieve certain minimum densities to have reduced car dependence.



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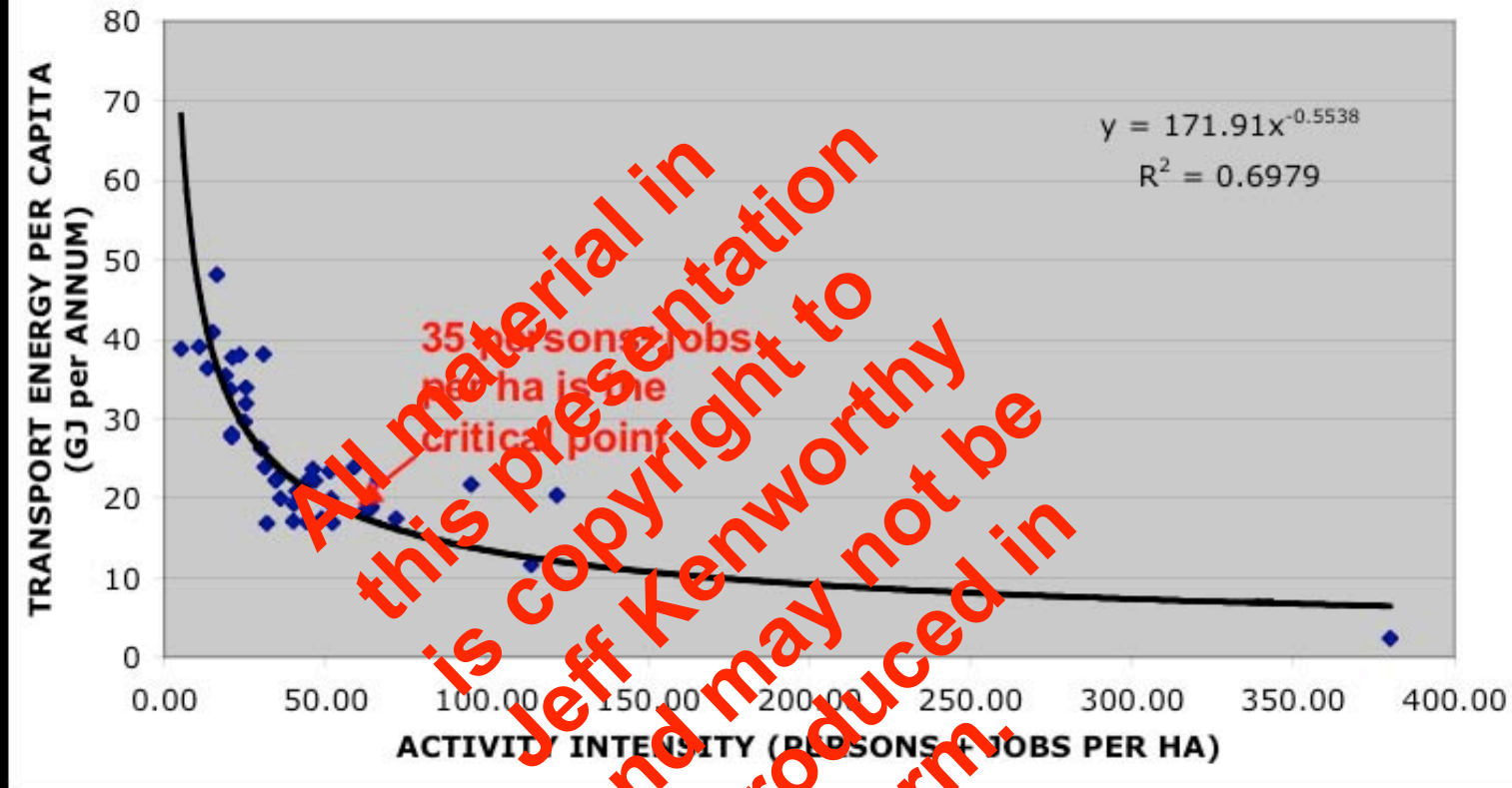
Munich's pedestrianised city centre (top) is an attractive place for people of all ages. Barcelona's La Ramblas (below) is the centre piece of the city.



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Arabella Park Sub-Centre, Munich, Germany: 10,000 residents, 18,000 workers set in traffic free space.

TOTAL TRANSPORT ENERGY USE VERSUS ACTIVITY INTENSITY IN SYDNEY, 2002



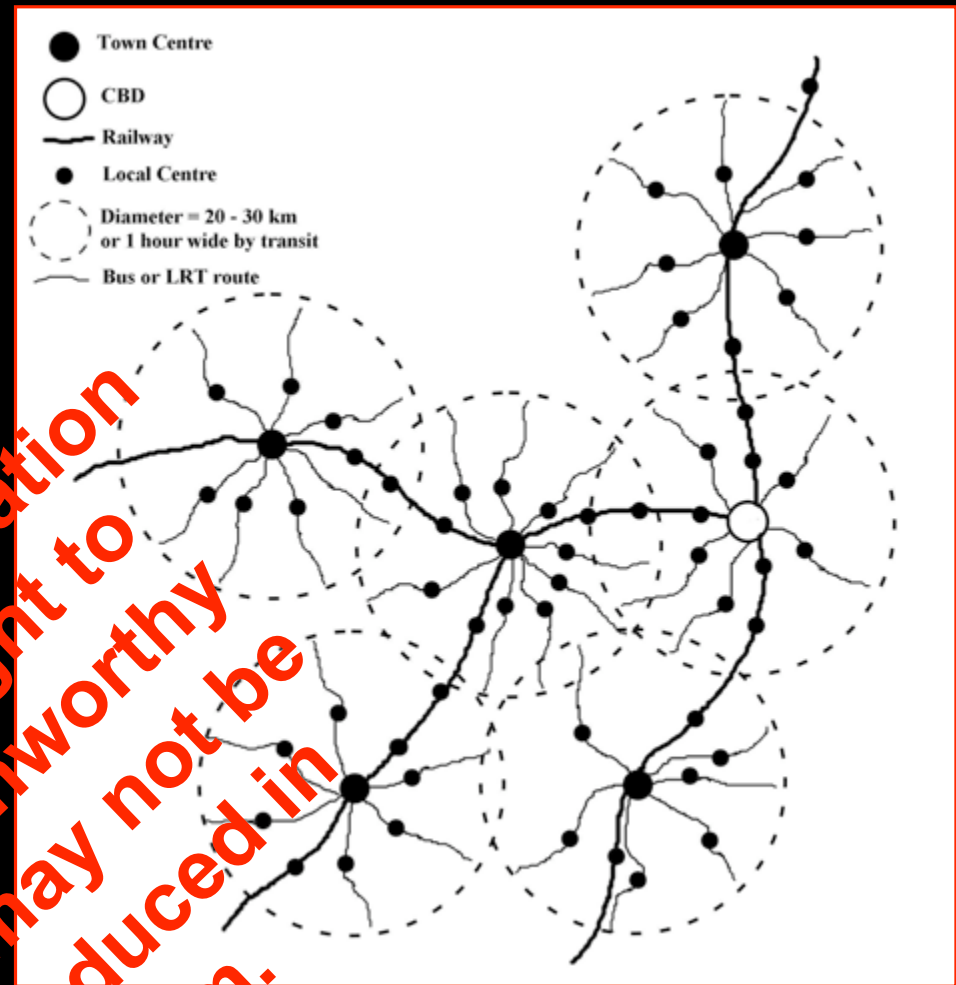
A 2006 study of Seattle, Portland and Vancouver (Vancouver Sun 21/6/06) showed that the higher the proportion of compact neighbourhoods (12 persons/acre or more or 30/ha), the lower the car use and obesity levels due to less time spent in cars and more time walking. Vancouver had 91% compact neighbourhoods and Seattle 34%, with 45% lower car use in Vancouver.

Chinese cities average around 150 persons per ha but many are reducing densities under automobile-based planning principles. Hong Kong is one of the densest cities in the world. All future urban planning needs to build on the tradition of high density development, but more ecologically.

Compact, mixed use urban form;
Human-oriented city centres and sub-centres;
Priority to supplying superior public transport
and non-motorised facilities, not more roads
and;
Protection of cities' natural areas and food
production potential...

These can all be incorporated within this
model for transforming the automobile city.

This is People-Oriented Development or POD.
So we now have TOD and POD.



Conceptual restructuring of an auto city

TOD can help to transform an auto city into a
networked set of public transport cities.

Local Centres: Ped Sheds of 10 min. walking
with 10,000 residents+jobs at 35 per ha
Town Centres: 30 min. walking area
containing 100,000 people+jobs at 35 per ha.

(5) High Quality Public Realm Throughout the City



If cars are allowed to determine the quality of the public realm the city is a disaster. Cars can be present, even in numbers, but the street can still be good for people.

Cities must respect and uplift the quality of public spaces and all the public places we hold in common in cities, including all the elements of the public transport system (stations, vehicles etc).



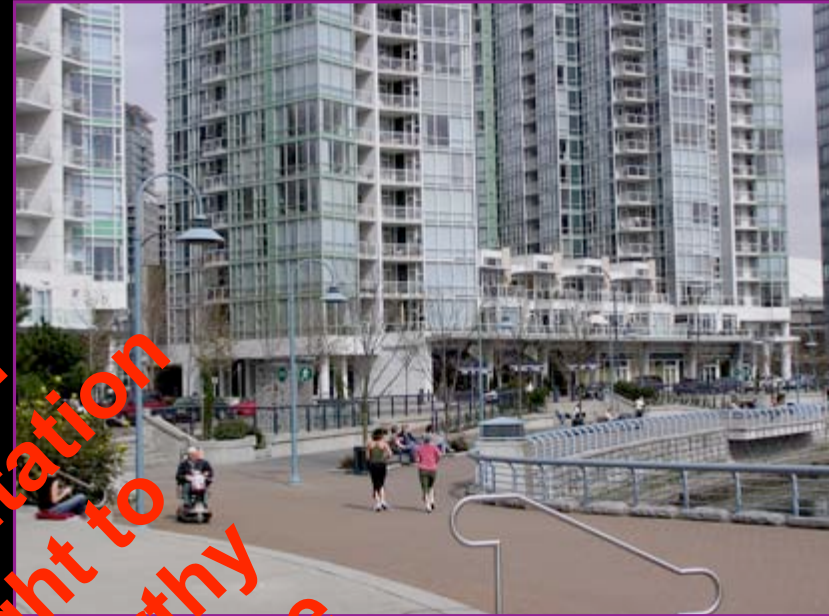
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The public realm can become a wasteland due to parking and roads (above left, Auckland). Robson Street, Vancouver (below left) is lined with a rich mixture of shops and restaurants with apartments above and has frequent trolley buses. It harmonises the needs of cars with those of people. Hangzhou is building huge freeways (top right), but also some people-oriented places (below right).

Yaletown



Yaletown



Coal Harbor



Arbutus Lands



Vancouver, BC is renowned for the quality of the public realm in all its new developments. Yaletown in Vancouver's central area is developing at an enormous rate, but the attention to the public realm is superb.



Shanghai

Good stations and good rolling stock..people feel respected.



Munich's public transport system mostly reflects a respect for this important aspect of the public realm.

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(6) Sustainable Urban Design Qualities That Meet Human Needs

Permeability: Access, where people can go and how easily

Variety: Mixed land uses; the range of uses available to people

Legibility: How easily people can understand and navigate around a place

Robustness: Flexibility to use a place for a variety of purposes over time

Visual Appropriateness and Richness: The appearance and enjoyment of places

Personalisation: How comfortable and familiar is the place; sense of place and ownership



Urban design must conform to certain qualities and standards that have been handed down through the centuries in great cities.



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Sustainable urban design is all about human comfort, making the city easy to move around, easy to read, long-lasting and full of variety.

(7) Economic Innovation Through Creativity and Environmental Quality



Cities are increasingly relying on the quality of their urban environments to promote economic innovation and economic growth. Poor environmental quality thwarts economic progress.

False Creek, Vancouver.

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**Economic
innovation
and growth is
increasingly:**

- **Placed-Based**
- and
- **Face-to-Face**



• The British Columbia (BC) Sprawl Report 2004 undertook a detailed statistical analysis of localities across the Vancouver region on the basis of:

- # Urban form
- # Economic performance
- # Livability

Communities that were most compact and mixed in their land use with the most public culture were also the most economically successful and the most livable.

The new economic development agenda in cities emphasises communities and creativity or COD...Community and Creative-Oriented Development

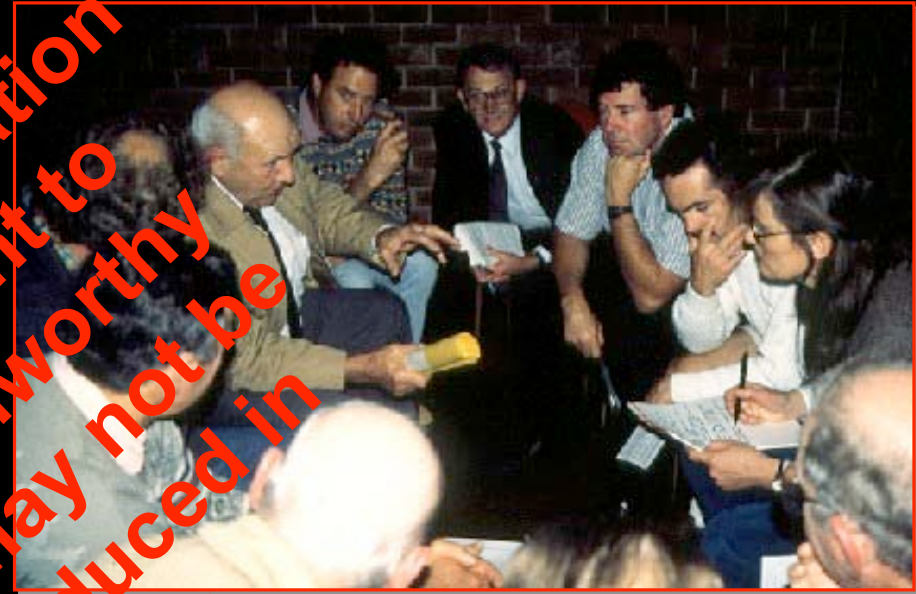
(8) Environmental Technologies for Energy, Food and Waste



For all their needs, cities must increasingly rely on technologies that are more resource conserving and less waste producing and which improve human quality of life by re-connecting people with natural processes. They must be as much as possible closed cycle systems.

We might call this Green-Oriented Development or GOD

(9) Planning is Visionary 'Debate and Decide', Not 'Predict and Provide'



'Predict and provide' produces sprawl, traffic and more freeways.

'Debate and decide' can produce new visions of a more sustainable city.

No city can become more sustainable unless it drops the old transport planning paradigms and adopts processes that rely on a vision and working towards that vision.

We cannot satisfy open-ended travel demand in any city.

We might call this Debate and Decide-Oriented Development or DOD

The “predict and provide” urban transportation planning process that just produces more freeways is flawed...

- It creates a vicious circle of roads, sprawl, congestion, more roads, more sprawl, more congestion: It increases energy use and emissions.
- Transport planners in Europe in the 1970s were told: “Well, you’ve shown us the future, now show us how to avoid it!!...”
- “With every million we spend on roads we will be closer to murdering our city” (Mayor of Munich, 1975).
- “Unconventional” results began to appear:
 - Nürnberg (Nuremberg) pedestrianisation of city centre
 - 29% of traffic transfers to other roads, 71% disappears; no one knows where.
- Lesson: If you take away road space, a lot of traffic disappears. This happened in Seoul when they tore down 6 km of 6 lane freeway.
- Traffic behaves more like a “gas”, than a “liquid”, but transportation planners and engineers trained to think of traffic as a “liquid”, that floods everything if you don’t provide channels for it to run.

(10) Decision-Making is Within a Sustainability Framework that Integrates, Social, Economic, Environmental and Cultural Factors

For example:

Dialogue with the City, Perth

- Metro-scale consulting of population with questionnaires to determine peoples' opinion on planning and transport issues.
- Then 1,000 people brought under one roof to play a formal urban planning game where they had to plan Perth to 2029, finding space for 250,000 new households.
- It made them realise the feedback and flow on effects of their urban planning decisions (e.g. more sprawl and roads lead to certain undesirable consequences, building around public transport, walking and cycling in more compact developments helps to ease these problems).

Such processes are increasingly synonymous with meaningful citizenship and developing the city on sustainability principles.

In summary, if we have TOD, POD, COD, DOD and GOD then more sustainable urbanization may become the new paradigm in human settlements. Perhaps then we will get SODs (sustainability-oriented developments) appearing everywhere.

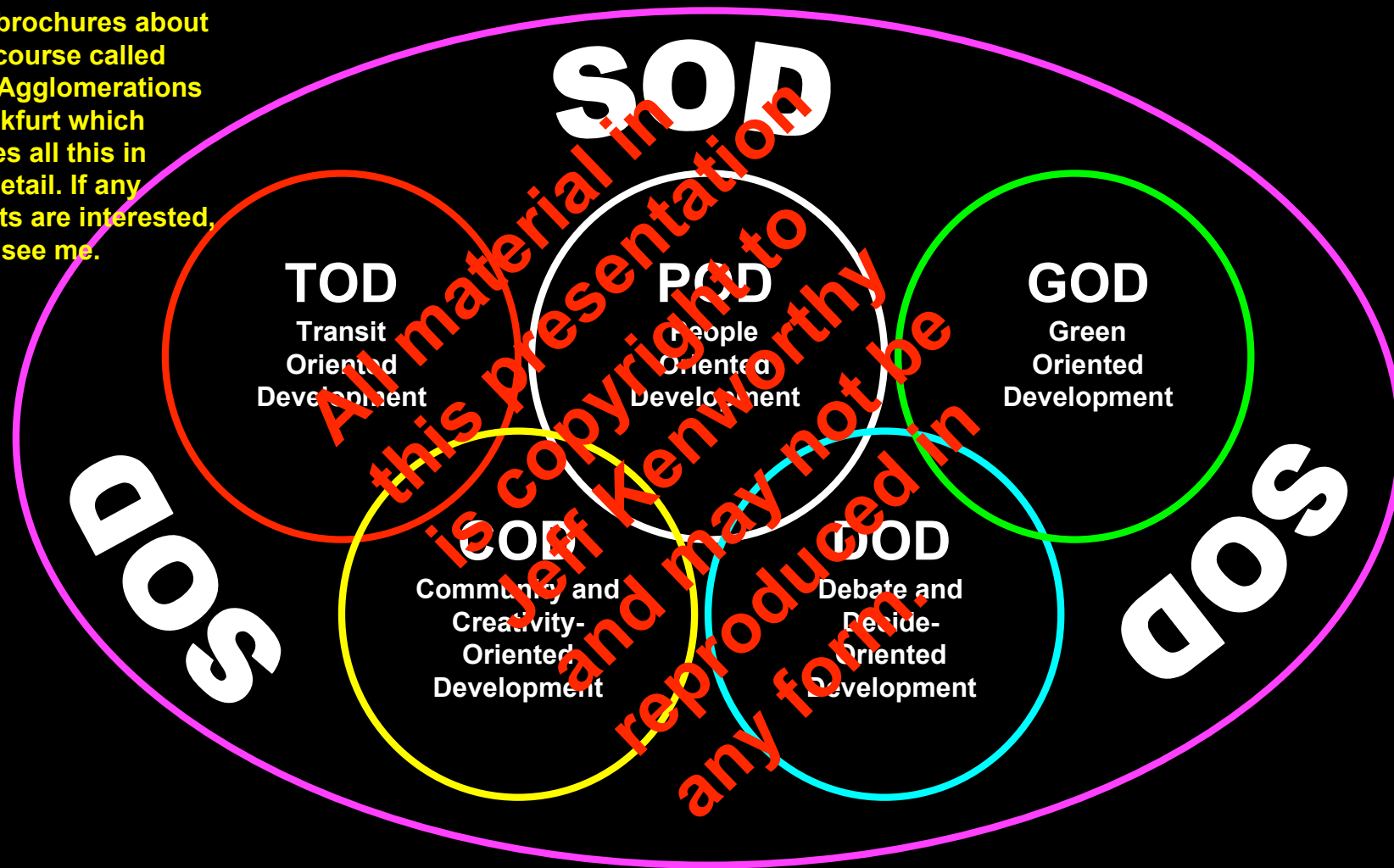
SOD

Sustainability-Oriented Development

An Idea for a New “Olympic Movement”?

Will Your Urban Project Get You a Medal as an Ecological City?

I have brochures about a new course called Urban Agglomerations in Frankfurt which explores all this in great detail. If any students are interested, please see me.



The Beijing Olympic Slogan for 2008 was “One World, One Dream”
SODs can help make it happen!!