1) Phenomenon to address
Explosive growth
Next 20 years:
From 3.5 to 5.5 b. = 2,000 m. in 20 years
300,000 every day
(India: 50,000
China 30,000)
Sigmoidal Curve

\[ S(t) = \frac{1}{1 + e^{-t}}. \]
Potential New Urban Market

**Sigmoidal Curve**

\[ S(t) = \frac{1}{1 + e^{-t}}. \]

- **2100 BC**
  - Asymptote: 11 billion
  - 70% urban: 7.7 billion
  - Actually urban: 3.5 billion

- **2100**
  - Potential new market: 4.2 billion
  - 2 b 20 years

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### The United Metro/Nations

<table>
<thead>
<tr>
<th>Rank</th>
<th>City/Country</th>
<th>GDP in US Billions</th>
<th>(% of National)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>United States</td>
<td>15094</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>China</td>
<td>7298</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Japan</td>
<td>5869</td>
<td></td>
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<tr>
<td>4</td>
<td>Germany</td>
<td>3569</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>France</td>
<td>2774</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Brazil</td>
<td>2476</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>United Kingdom</td>
<td>2416</td>
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</tr>
<tr>
<td>8</td>
<td>Italy</td>
<td>2198</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>India</td>
<td>1897</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Russia</td>
<td>1857</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Canada</td>
<td>1739</td>
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<tr>
<td>12</td>
<td>Spain</td>
<td>1492</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Australia</td>
<td>1483</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Tokyo Japan</td>
<td>1479 ($1479) (25%)</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>New York USA</td>
<td>1406 ($106) (10%)</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Mexico</td>
<td>1154</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>South Korea</td>
<td>1116</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Indonesia</td>
<td>846</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Netherlands</td>
<td>837</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Los Angeles USA</td>
<td>792 ($792) (15%)</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>Turkey</td>
<td>773</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Switzerland</td>
<td>637</td>
<td></td>
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<tr>
<td>23</td>
<td>Saudi Arabia</td>
<td>576</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>Chicago USA</td>
<td>574 ($574) (18%)</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>London UK</td>
<td>565 ($565) (23%)</td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>Paris France</td>
<td>564 ($564) (20%)</td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>Sweden</td>
<td>537</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>Poland</td>
<td>514</td>
<td></td>
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<tr>
<td>29</td>
<td>Belgium</td>
<td>512</td>
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<td>30</td>
<td>Iran</td>
<td>499</td>
<td></td>
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<tr>
<td>31</td>
<td>Norway</td>
<td>485</td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>Taiwan</td>
<td>467</td>
<td></td>
</tr>
<tr>
<td>33</td>
<td>Argentina</td>
<td>446</td>
<td></td>
</tr>
</tbody>
</table>

Among the top 100, 45 metros

68 Shanghai China  $233 (3%)
69 Egypt           230
70 Philippines     224
71 Frankfurt Germany $221 (6%)
72 Ireland         217
73 Algeria         217
74 Czech Republic  215
75 Sydney Australia $213 (15%)
76 Mumbai India    209 (11%)
77 Pakistan        209
78 Rio de Janeiro Brazil $208 ($25%)
79 Phoenix USA     $200 (43%)
80 Iraq?           195
81 Minneapolis USA $194 (45%)
82 San Diego USA   $191 (46%)
83 Romania         189
84 Kazakhstan       186
85 Istanbul Turkey  $182 (24%)
86 Barcelona Spain $177 (32%)
87 Peru            176
88 Melbourne (Australia) $173 (26%)
89 Qatar           173
90 New Delhi India $167 (20%)
91 Beijing China   $166 (5%)
92 Denver USA      $165 (47%)
93 Ukraine         165
94 New Zealand     161
95 Kuwait           156
96 Manila Philippines $149 (66%)
97 Montreal Canada $148 (23%)
98 Cairo Egypt     $145 (63%)
99 Rome Italy      $144 (65.5%)
100 Guangzhou, China $143 (7.5%)
Facilities

petrol stations


Source: Geoffrey West
\[ x \times 2 = +15\% \]

From 100 to 200 in size, equals 230 in GDP

Transport investments can do that for you
You integrate two cities you increase GDP by 30

THE GOOD, THE BAD & THE UGLY

DOUBLING THE SIZE OF A CITY SYSTEMATICALLY INCREASES INCOME, WEALTH, NUMBER OF PATENTS, NUMBER OF COLLEGES, NUMBER OF CREATIVE PEOPLE, NUMBER OF POLICE, CRIME RATE, NUMBER OF AIDS & FLU CASES, AMOUNT OF WASTE,..........

ALL BY APPROXIMATELY 15% REGARDLESS OF CITY

Source:Pedro B. Ortiz
Source:Geoffrey West
The efficiency impact of metro transport from the 15% rule

Effect of Metropolitan Transport:
A disjointed metropolis with 8 unconnected municipalities produces 800. If connected in a single polycentric metropolitan system by transport, they will produce 1295: 62% more.

www.PedroROrtiz.com
Metropolises are not an aggregation of municipalities. They are an entity on their own.

Aggregative = Summation

Synthesis = Integral
2) How to manage it
Collective Intelligence
## Metropolitan Scale

### Spatial Scales and Disciplinary approach

<table>
<thead>
<tr>
<th>Scale</th>
<th>Discipline</th>
<th>Knowledge areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>1: 50,000,000</td>
<td>Geopolitics</td>
<td>UN. NATO. US. EU. IMF, OPEP,</td>
</tr>
<tr>
<td>1: 5,000,000</td>
<td>‘Regional’ (Continental) Politics</td>
<td>UN. OAS. WB. BID. ADB. AFDB.</td>
</tr>
<tr>
<td>1: 500,000</td>
<td>National Development</td>
<td>Politics, Economics, Sociology, Environment, Geography</td>
</tr>
<tr>
<td>1: 50,000</td>
<td>Metropolitan Planning</td>
<td>Economics, Sociology, Infrastructure, Environment, Utilities</td>
</tr>
<tr>
<td>1: 5,000</td>
<td>Urban Planning</td>
<td>Housing, Industrial, Services, Commerce, Transport, Environment</td>
</tr>
<tr>
<td>1: 500</td>
<td>Urban design</td>
<td>Space, Volume, Semiotics, Engineering,</td>
</tr>
<tr>
<td>1: 50</td>
<td>Architecture</td>
<td>Light, Space, Texture, Materials, Structure, Installations, Budget</td>
</tr>
</tbody>
</table>
TERRITORIAL GOVERNANCE

City Hierarchical/Orbital Governance
Citizens/Municipality Dialogue

Metropolitan Matrix Governance
Inter/administrative Dialogue

Source: www.PedroBOrtiz.com
TERRITORIAL GOVERNANCE

City Hierarchical/Orbital Governance
Citizens/Municipality Dialogue

Metropolitan Matrix Governance
Inter/administrative Dialogue

Bottom-Top Dialogue

Peer Dialogue

Source: www.PedroBOritz.com
Metropolises are like Countries, not Cities. Countries are run as Federal or Unitary Govt. systems. Not Confederations.
NATIONAL-STATES GOVERNANCE SYSTEMS

- **Confederal**
  - Sovereign unit/states

- **Unitary**
  - Centralized Ministries

- **Federal**
  - Sovereign Federal Union
  - States

- **Unitary Decentralized**
  - Decentralized Delegations
Main Metropolis as % of National GDP
(... and political significance)

60% Egypt, Philippines, Argentina...
30% France, England, Spain...
5% Germany, Italy, China, USA...

Unitary Decentralized Federal
GOVERNANCE SYSTEMS

1) Round Table Sharing
2) Parallel Projects Coordinating
3) Common Project Combine
4) Management Agency Join (not merge)

5) Management Institution Sectorial
6) Metropolitan Government Federal

7) Delegated Unitary Decentralized
8) Unitary Centralized

9) United Nations Combine

Different DNA

Municipal Confederation

Federal Metropolis

Central Government

Source: www.PedroROrtiz.com
GOVERNANCE SYSTEMS

1) Round Table  
   Sharing
2) Parallel Projects  
   Coordinating
3) Common Project  
   Combine
4) Management Agency  
   Join (not merge)

5) Management Institution  
   Sectorial
6) Metropolitan Government  
   Federal

7) Delegated Unitary  
   Decentralized
8) Unitary  
   Centralized

9) United Nations  
   Combine

Different DNA

Municipal Confederation
   worm

Federal Metropolis
   snake

Central Government

Source: www.PedroBOrtiz.com
Metropolitan Brainshops
3) How to shape it
With 3,000 years of experience
"A Metropolis is a set of urban units that share significant daily commuting"
Economies of Scale Dilemma

Economic Efficiency v. Social Equity

Efficiency = Concentration
Dispersion = Redistribution
Two Systems

Radial - Orbital Features
- Market controlled by Supply
- Speculation
- Cost of land
- Congestion
- Unstable traffic equilibrium
- Centrality inaccessible to lower incomes
- Centrality = power: Centralized power

Reticular - Grid Features
- Market controlled by Demand
- Competition in cost of land
- Trip Alternatives
- Stable equilibrium traffic
- Multiple centralities
- Distribution of power: Peoples empowerment
King: Essential piece, game objective. Limited movement, but determines all the strategy.

Queen: The most strategic piece. The one that articulates and supports the essential strategy of the game.


Knight: Territorial piece, articulates an area around it. Does organize and provides backing for secondary pieces.

Rook: Edge piece, controls the borders of the game. Develops long range strategies on the sides.

Urban Centrality (TOD) typologies

1) Intermodal Station
   - Buses/taxis/parking
2) Public/Green Space
3) Commercial/ Offices
4) Residential
5) Institutional Building
6) Social Facilities

- Iconic social reference
Required contiguity

- Residential (City)
  - Basic services of city level
  - Commuter station

- Metropolitan (Supracity)
  - Metropolitan level services or specialized
  - IE: hospital hubs, sports, cultural, administrative
  - Station linked to airport

- Business
  - Train and freeway, double access
  - Offices

- International
  - Base economy firms
  - Export production
  - Quaternary services
Coast
New York, Mumbai, ...

River
Paris, London, New Delhi, ...

Pass
Koln, Madrid, ...

Valley
Medellin, Quito, ...
Alternative to Metro Matrix Mental Map?
Mosquito strategy planning approach:
Random extensive ‘blood’ extraction
- 35 Centuries old

- Step forward: Metropolitan Scale

Villeneuves XIV
Buenos Aires 1580
Indianapolis 1820
Italia Padana 1964
Madrid 1996
Colombo 1996

New York 1811
Barcelona 1864
Milton Keynes
New York 1929
Los Angeles (Empirical)
Mexico DF ???

In a Metropolis the unit of distance is time
Isostatic Roof Trusses

a) Fink o W

b) En Abanico

c) Fink combada

d) Howe

e) De pendolón

f) Pratt

g) Warren Plana

h) Pratt plana

i) De arco y cuerda
Metro Mental Maps
12 Grandes Proyectos Estratégicos Estructurantes

1) Ampliación Aeropuerto
   HUB: Asia Sur y Asia Pacífico

2) Tren Acajutla – San José: 120 km
   Exportación industrial México y USA

3) Centralidad 5º Centenario

4) Tren Cercanías Cojutepeque - Quetzaltepeque
   Futuro: Santa Ana-San Vicente

5) LRT 5to Centenario – Sta. Tecla.
   En el futuro Metro y Cercanías 5to. C.-Lourdes

6) Centralidad/Patrimonio Verde: Lago de Ilopango

7) a) Conexión Ilopango – Santo Tomas
   b) Conexión Apopa - Tonacatepeque

8) Urban Rural Linkages, Altiplano edafológico

9) Centralidad Puerta Norte Apopa
   Relocalización Logística y Productiva

10) Centralidad Este Soyapango - Ilopango
    Aeropuerto Mercancías
    Producción Alto Valor Añadido

11) Centralidad Productiva Sitio del Niño

12) Conexión San Martín – Mejicanos y
    Tonacatepeque - Ayutuxtepeque
Monocentric Structure

Sprawl Structure

Polycentric Structure

Multipolar Structure

Conurbation metastasis

Webfoot phenomenon

Sustainable Metropolis

Environmental Segmentation

Source: www.pedrobertiz.com
The Metropolitan Digit: The Urban Fabric Unit

The Metropolitan stem cell: The municipal **Balanced Urban Development (BUD)**
Cedric Price, with a acute sense of humor, compared the history of western cities evolution to an egg breakfast recipe.

His hand drawing is so expressive that no comment is required. Each viewer draws his conclusions beyond his smile.
Urban Manifest Destiny

... from an idea of Cedric Price

Town
XVI C.

City
XIX C.

Conurbation
XX C.

Metropolis
XXI C.

www.pedrohorta.com
3) High capacity mass public transport is the only means to keep Metropolises running. Distances and speed, apart capacity, is the requirement that makes rail tracks the upper mode. BRTs, buses and other complementary modes have to be subsidiary to the upper rank one.

4) The topologic layout of the rail tracks mass public transport should both foster central metropolis accessibility to substitute the use of private means and avoid a single centrality point that will create congestion.

The multimodal centrality layout will respond to both objectives.
But eggs in a metropolis can not only be scramble. Nor should only be eggs...

Poached  Fried  Scramble

Buttered  Marmalade  Banana

Peanut butter  Croque Monsieur  Croque Madame

...and many more

Cluster polycentrism.
Huevos rancheros mexicanos

Nasi Goreng, Indonesian Fried Rice Egg

Thank you