



**37TH INTERNATIONAL
NO-DIG
FLORENCE 2019**

Fortezza da Basso • FLORENCE (Italy)

30th September • 2nd October 2019

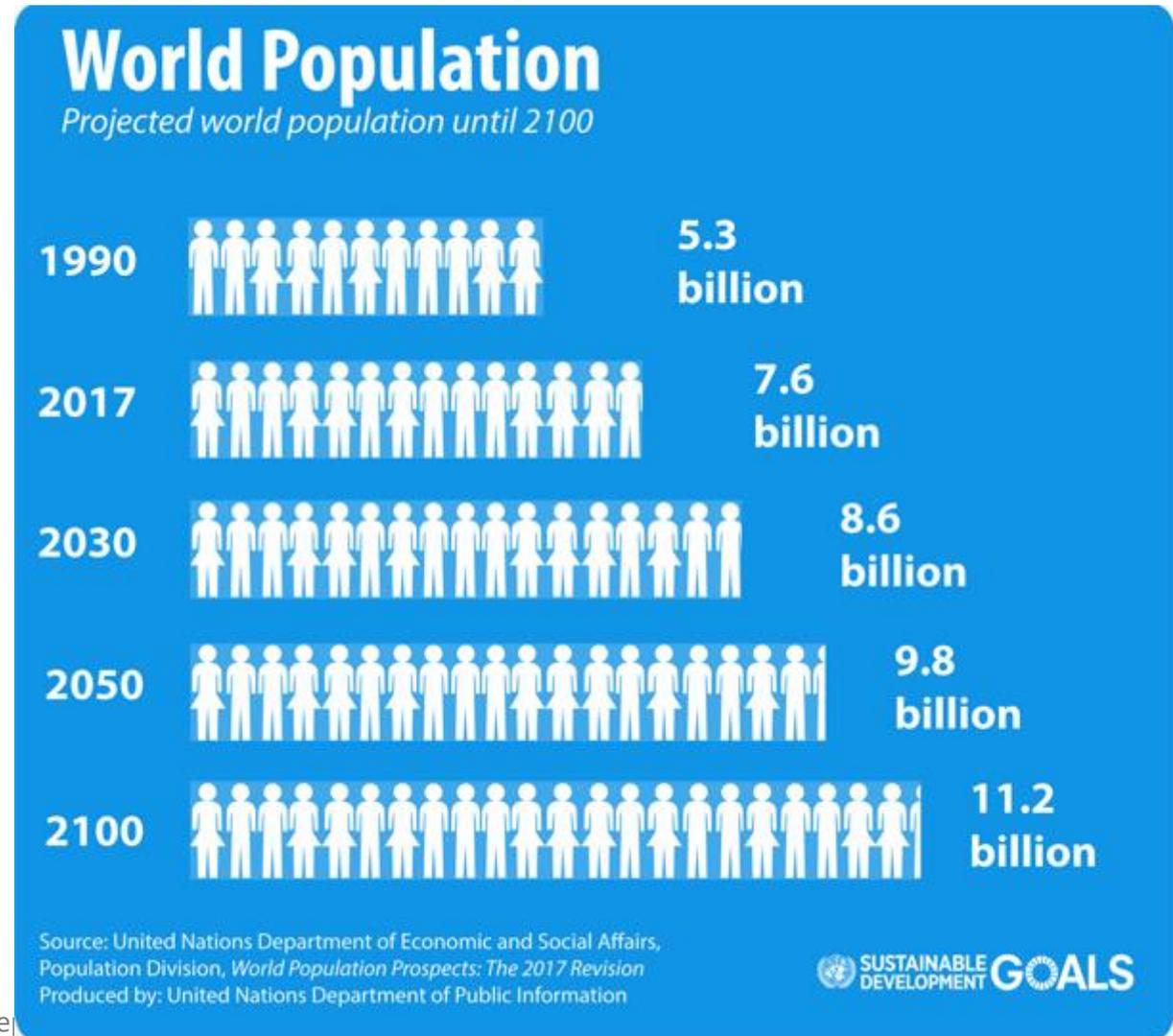
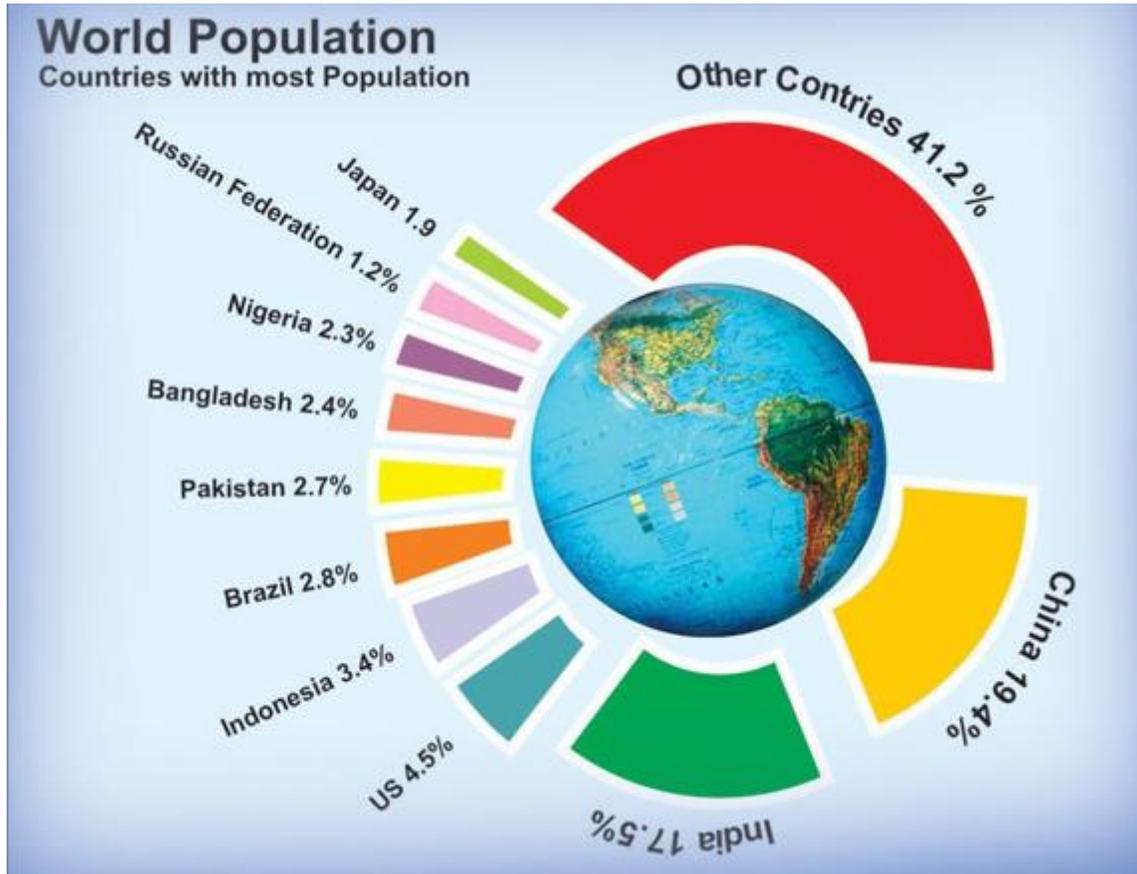
URBANIZATION AND THE IMPORTANT ROLE OF TRENCHLESS TECHNOLOGIES

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World Population Growth

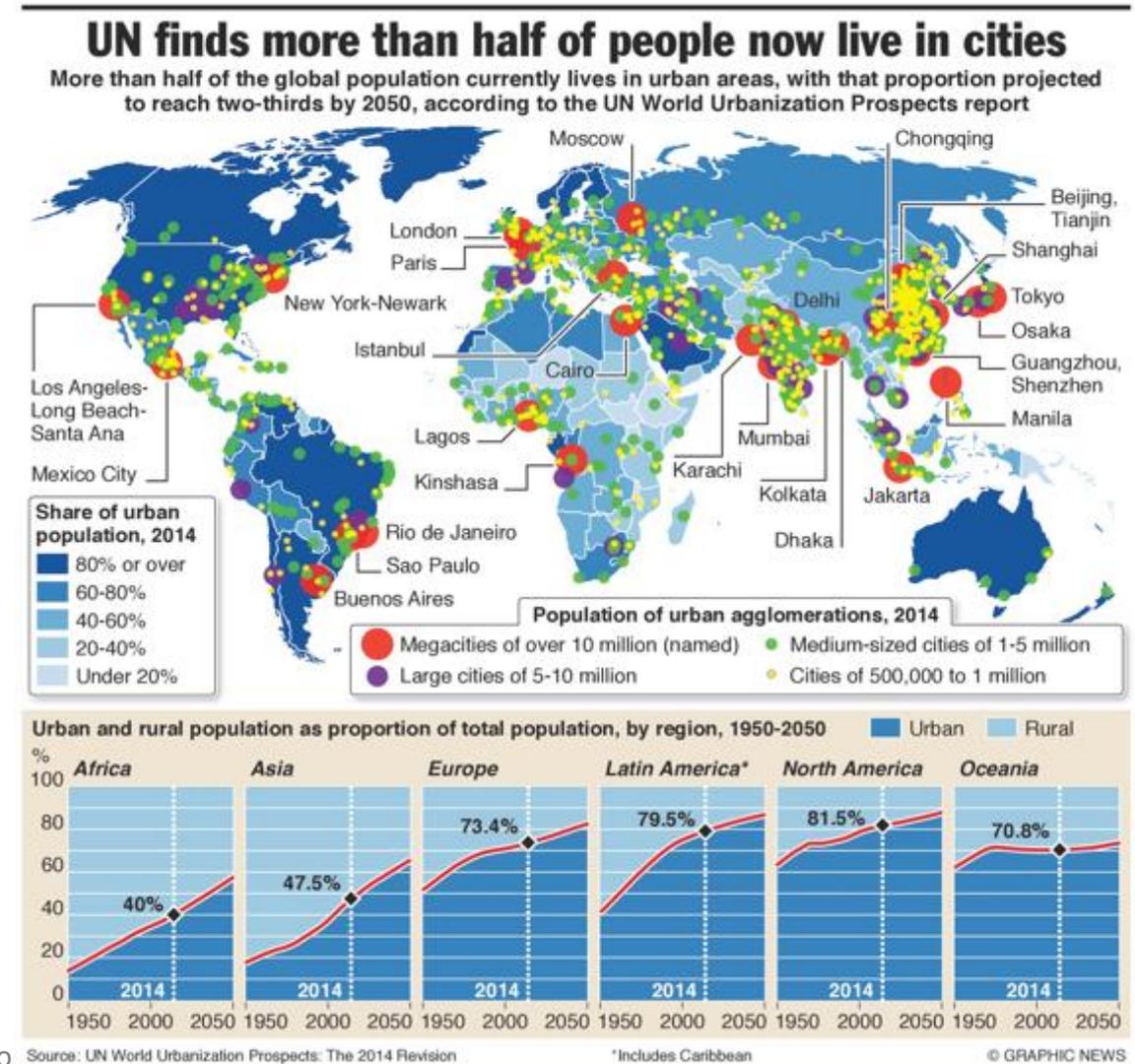


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Urban Centers

- Currently, **54%** of the world's population (**81%** in the U.S.) live in urban areas
- This figure is expected to increase to **75%** by the year **2050** as people look to urban centers for employment opportunities

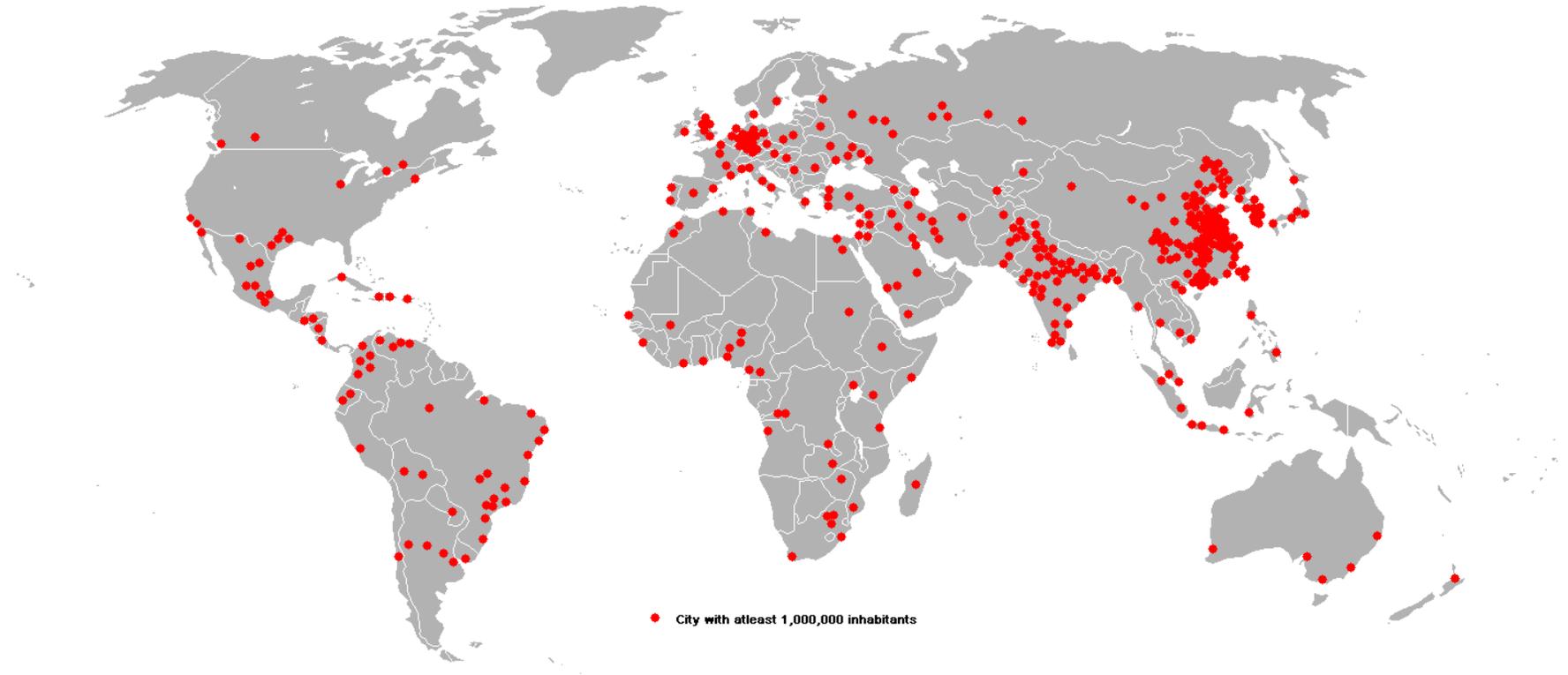


Urban Infrastructure Development

It took us 5,000 years to get to this point; however, it is expected that we will **double** our urban infrastructure in the next 35 years through construction. These new systems will last more than 50 years.



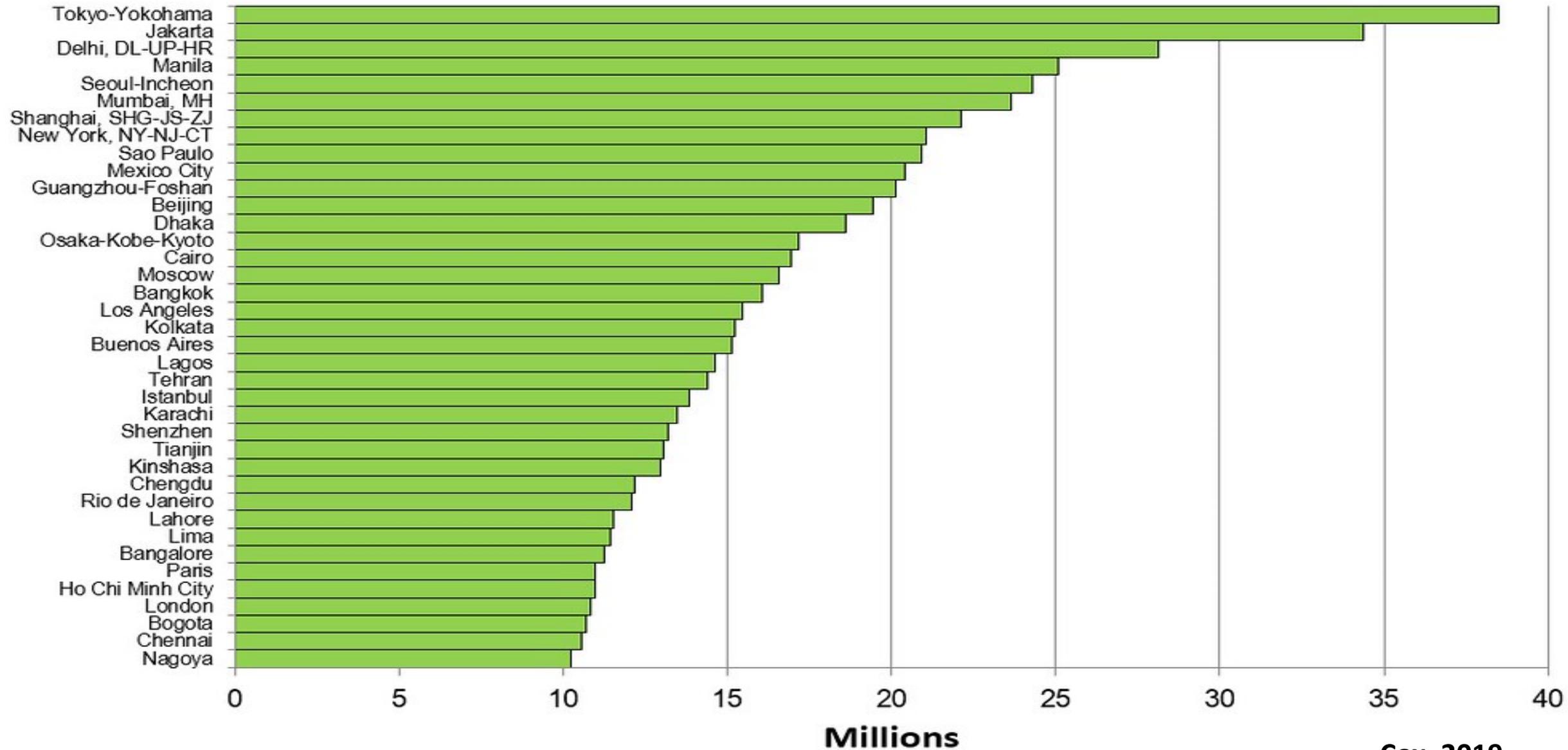
Urbanization is turning big cities into Megacities



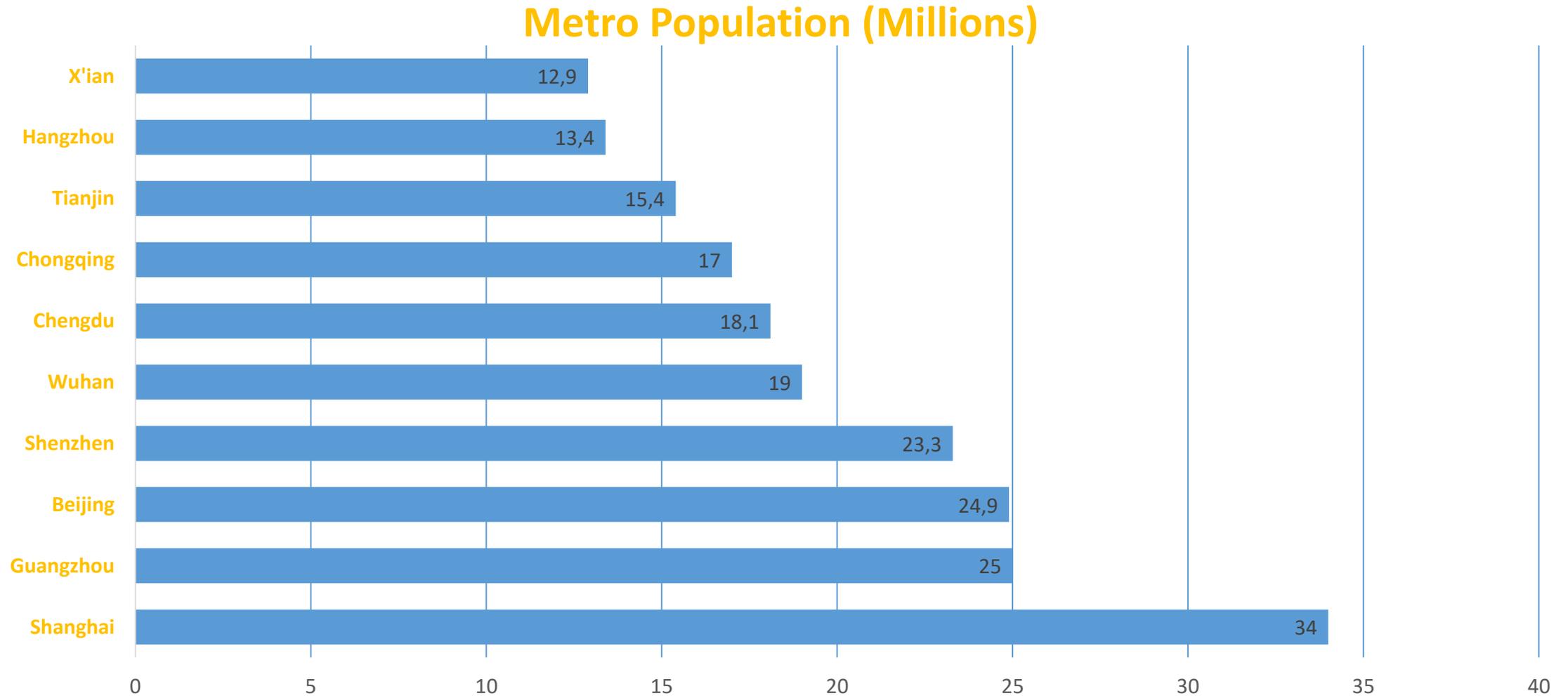
- More than 40 percent of the world's population already lives within 100 kilometers of the sea
- Another 40 percent live in cities along the rivers
- The majority of the world population lives close to waters

The 38 Megacities (2019)

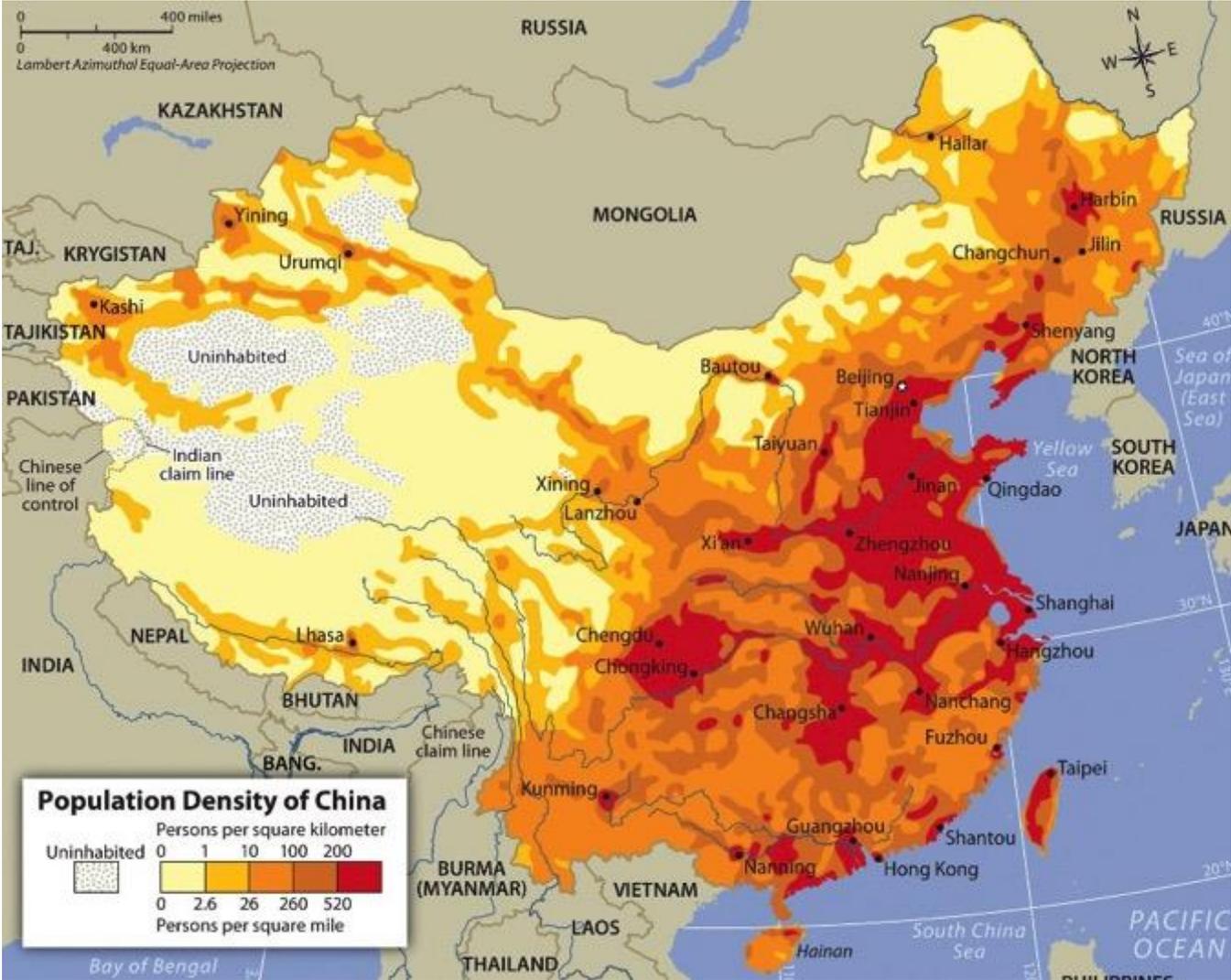
URBAN AREAS WITH MORE THAN 10 MILLION POPULATION



Mega City Populations in China



Population Density in Mainland China



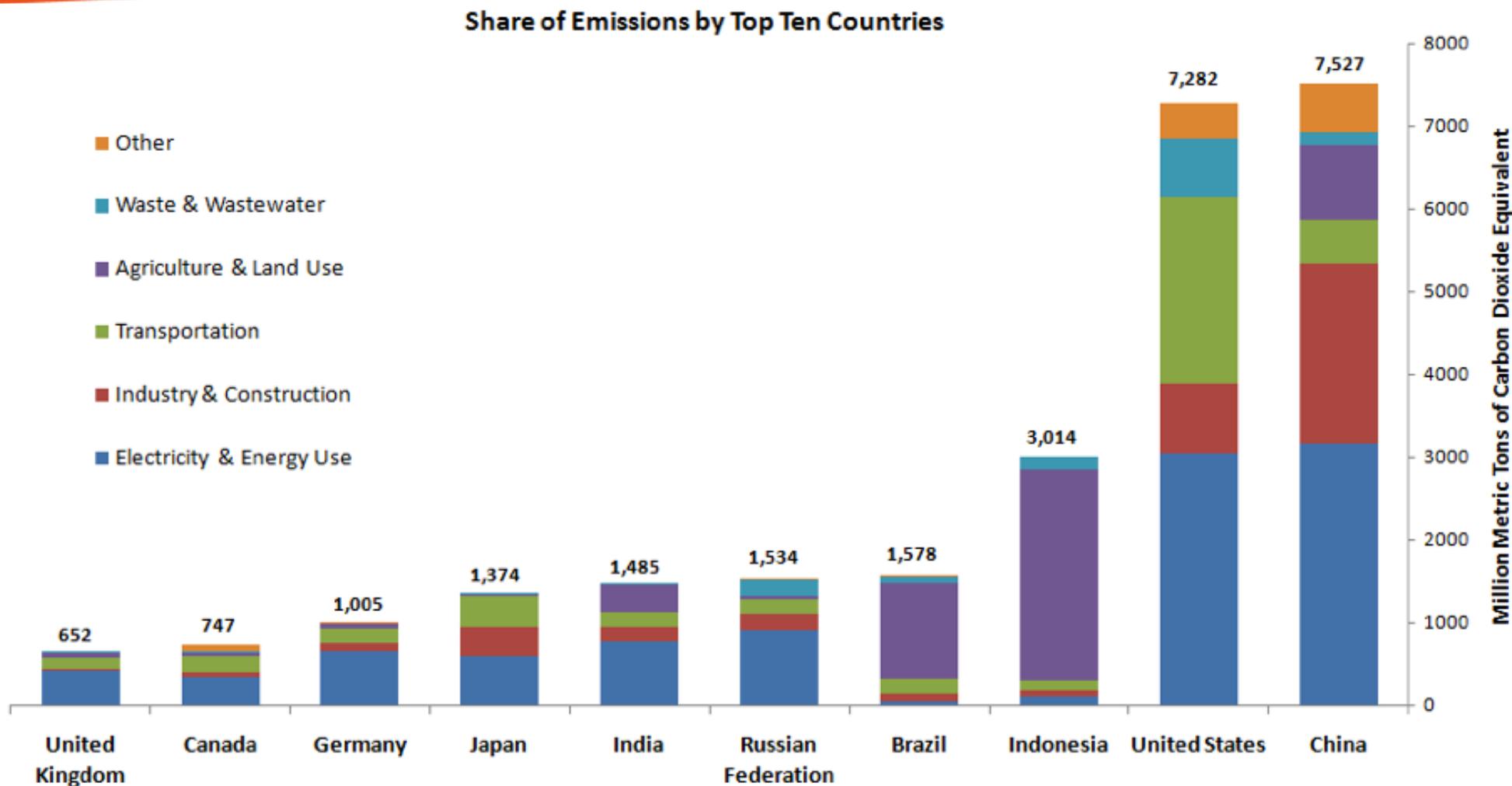
Urbanization is turning big cities into Mega cities

Space on the surface is becoming more narrow. Future lies in the underground.

- Limited space available to install utility services such as sewage lines, water pipeline, electric cables, gas pipelines, communication cables etc.



Global Anthropogenic GHG Emissions by Country

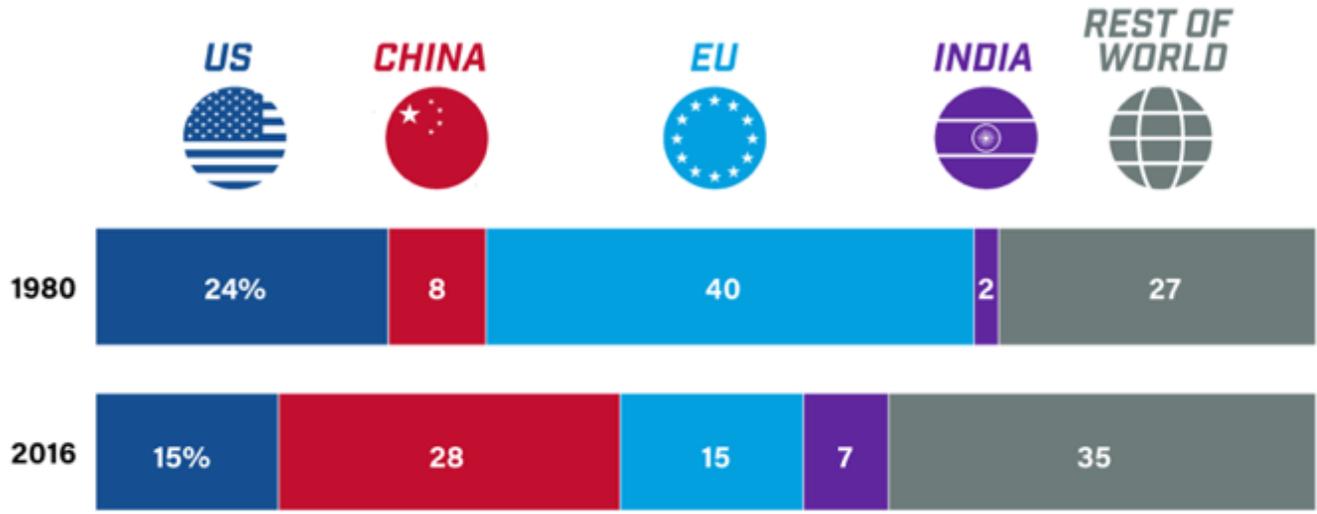


Source: Brown and Sovacool. 2011. *Climate Change and Global Energy Security*, Figure 2.1

Global CO2 Emissions



Share of global CO2 emissions [%]



PM2.5 Particulate Matter Concentrations

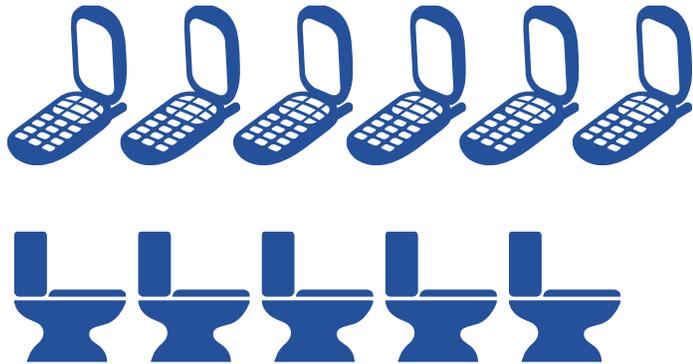
Tianjin, China



Infrastructure Needs

Developing World:

- more cell phones than toilets
 - 7 billion in world, 6 billion have mobile phones, only 4.5 billion have toilets...



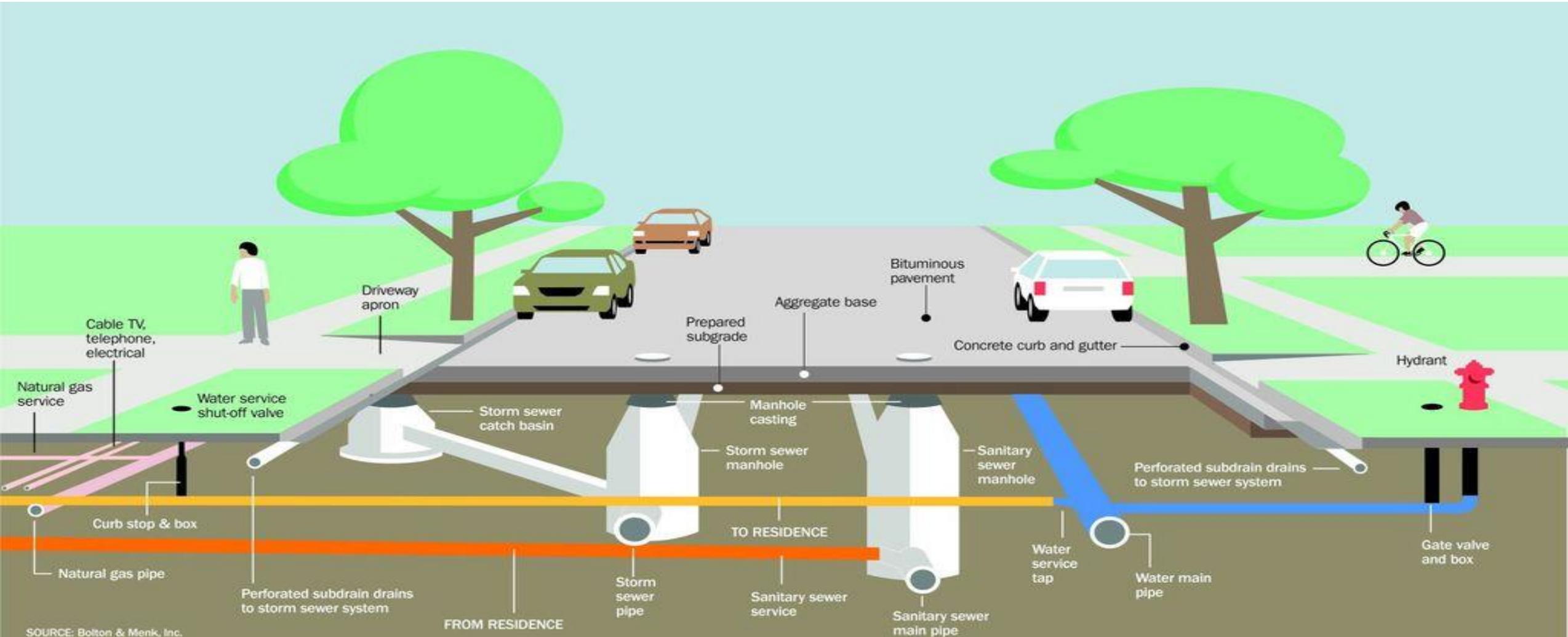
Developed World:

- 2017 ASCE Report Card on U.S. Infrastructure:
 - Water = D
 - Wastewater = D+

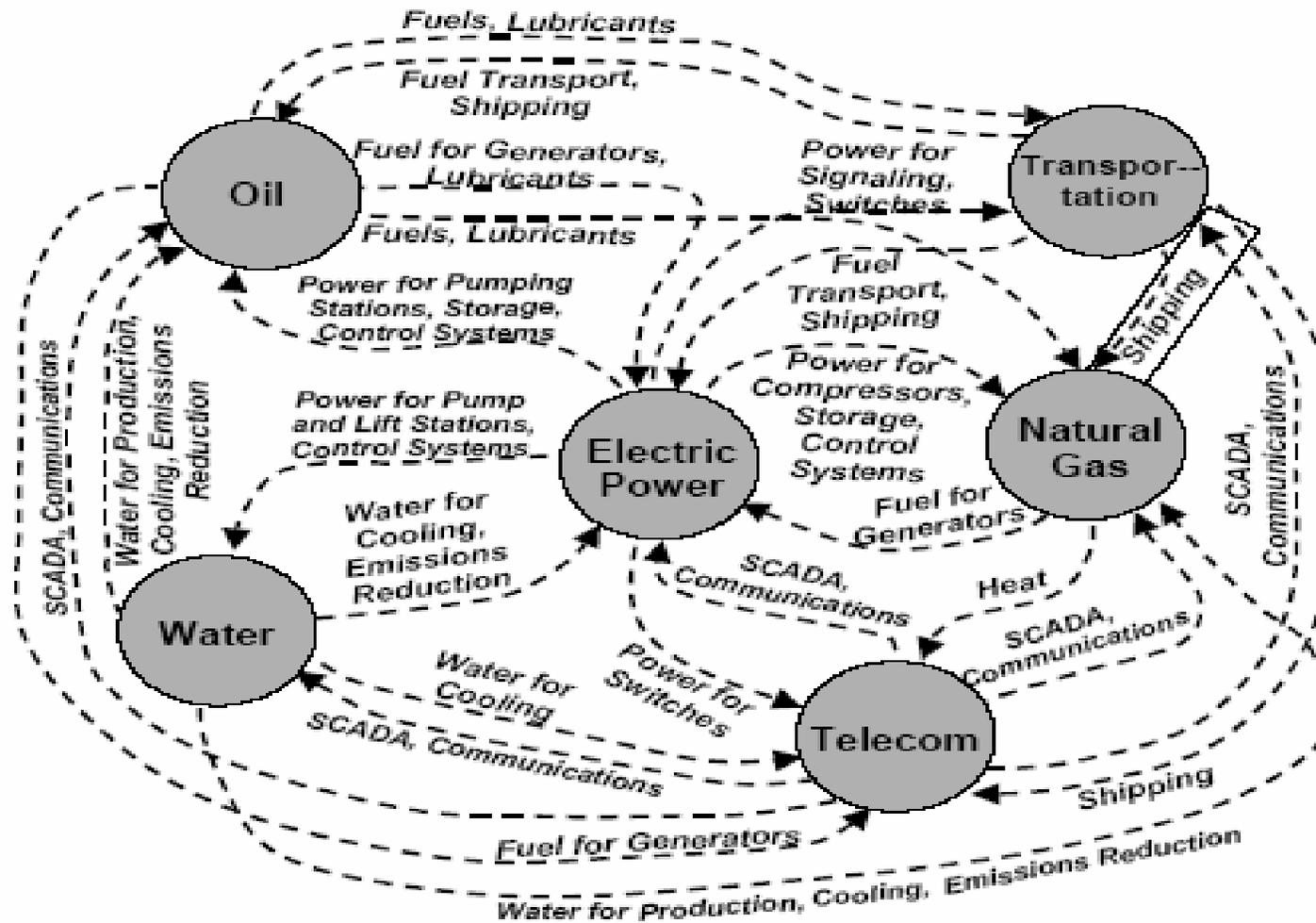




The Underground World of Utilities

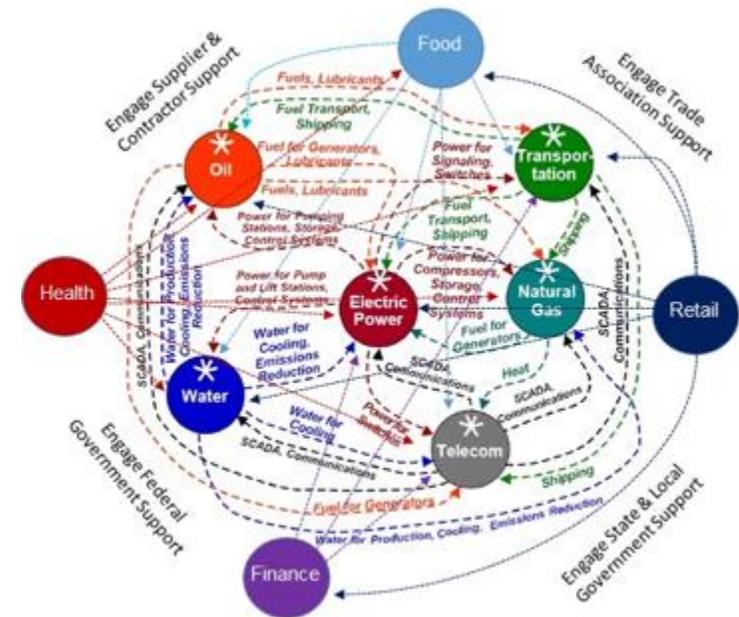


Interdependencies Among Infrastructures



Types of Interdependencies

- Technological
- Cyber: Data, Middleware, Hardware, Applications
- Geographic/spatial (e.g., co-location)
- Social/human, including notification, communications, and response
- Economic
- Political/policy/legal
- Organizational/business
- Resources, supply chain
- Security



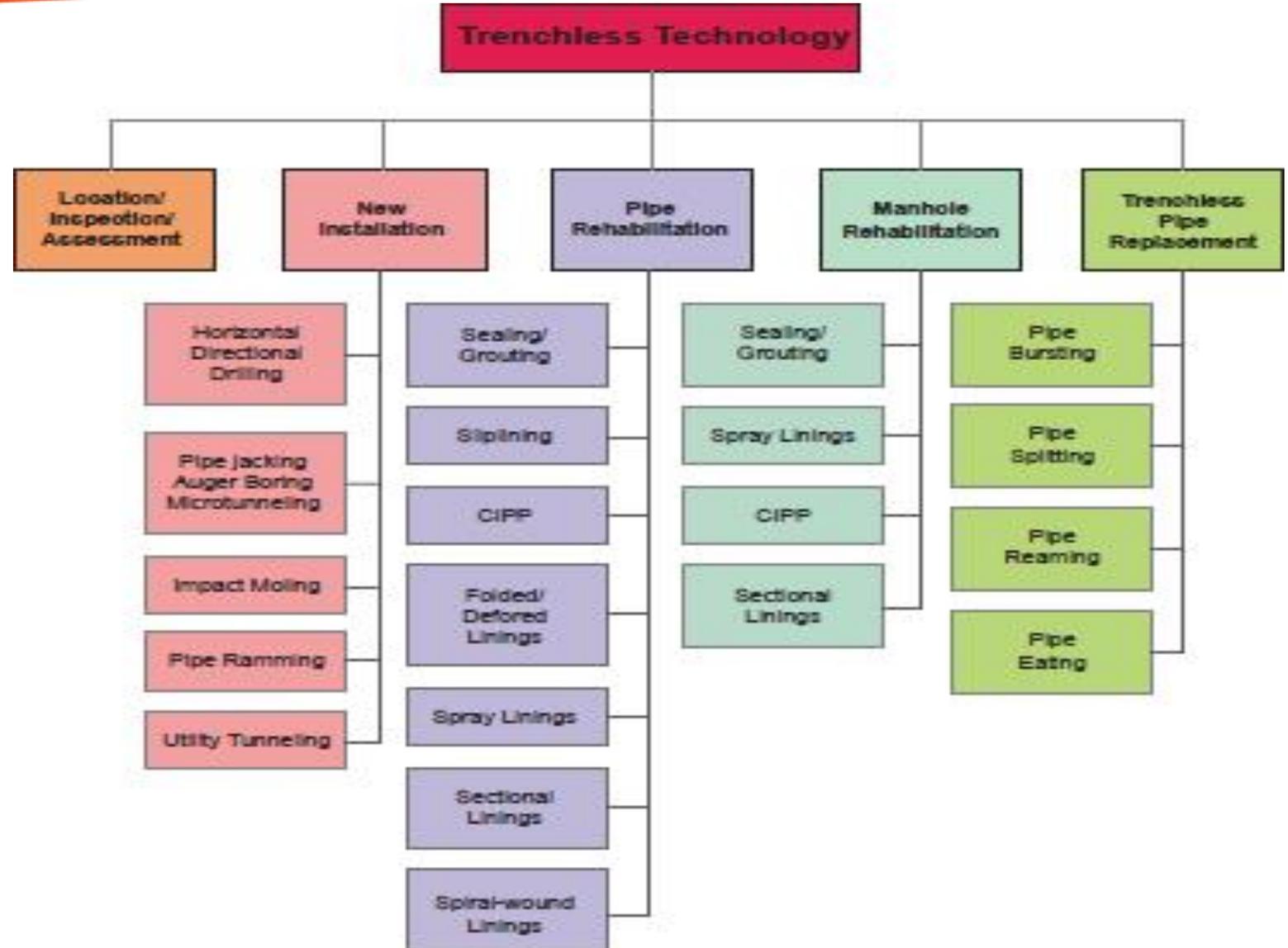


ROAD
CLOSED

Manhole Rehab
vacuum excavating
green
directional drilling
pipe bursting
rehab
Sustainability
Bernie
State-of-the-Art
modern
innovative
awesome No-Dig Show leading-edge
HDD
Solutions
Smart Business
trenchless
laterals
specialty
Pipe Ramming
low social impact
satisfying safety
amazing
pipe relining
underground
environmental
Leading-Edge
Infrastructure
Unique
cool
urban
Necessary Engineering
Best Value
low impact
low social impact
cipp
Slip lining
Dynamic
edge
least intrusive
amazing projects pipe cleaning
global community Pipe Jacking
underappreciated Planning
niche
social cost
Minimized
Disruption
Asset Management
effective
microtunneling
Bypass Pumping
CCTV
nassco
Auger Boring
Ingenious
Inventive
nuca
utilities

Trenchless Technologies

- Numerous available options
- New Installation, Rehabilitation, and Replacement
- Minimal disruption to surface activities
- Economical
- Environmental benefits





Pipeline Inspection – Scanning & Evaluation



USMH: 1386A
DSMH: 1386

Vermin Rat

14.5 ft.







Lining Technologies





Washington, DC

Colombo, Sri Lanka





Mess of Overhead Cables Yangon, Myanmar





Burying Overhead Electrical Cables Shanghai, China

申
815
4137
又

Palm Islands, Dubai, UAE





15 8:24



Madrid, Spain

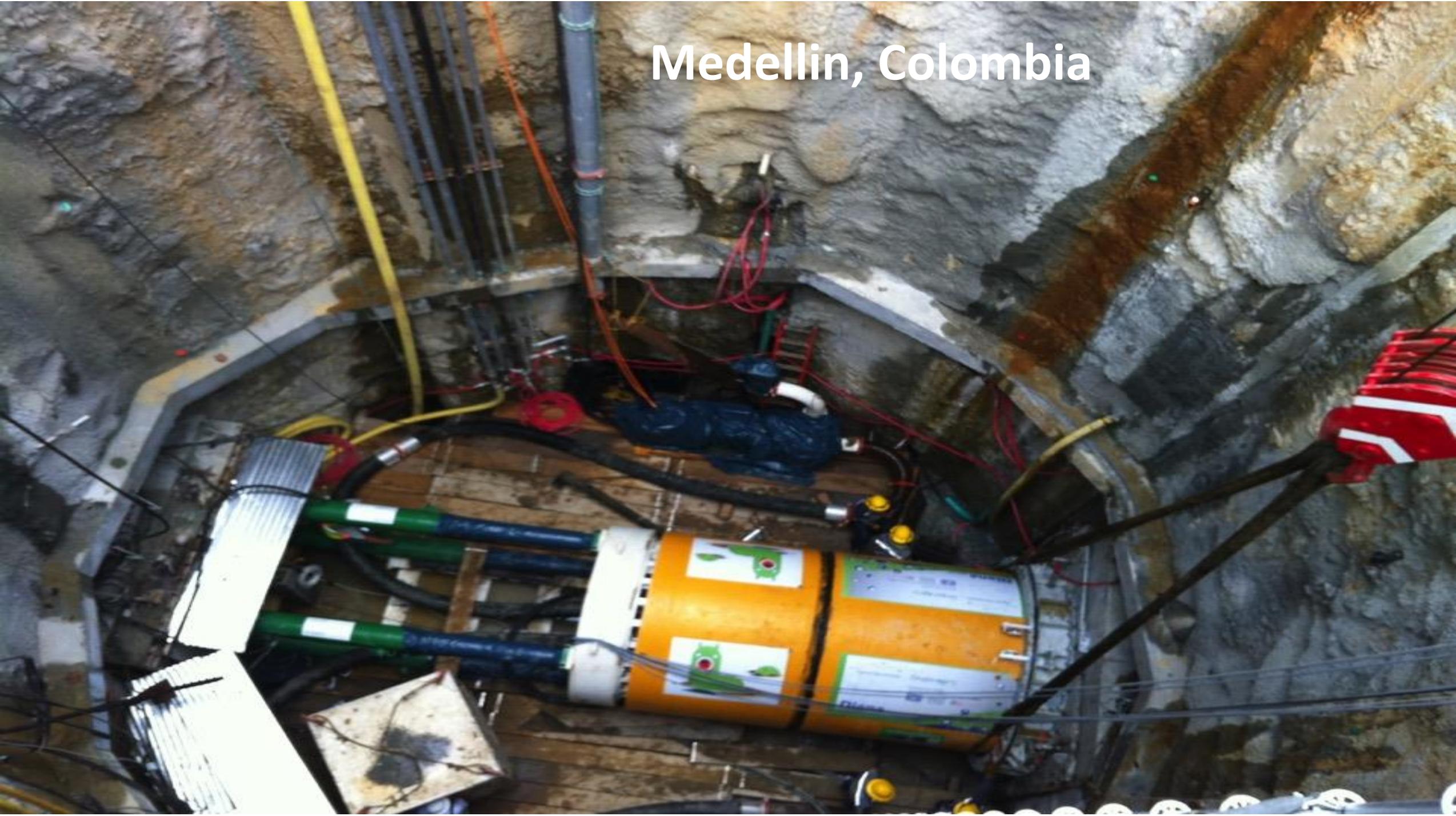




National Mall, Washington, DC



Medellin, Colombia





Sydney, Australia

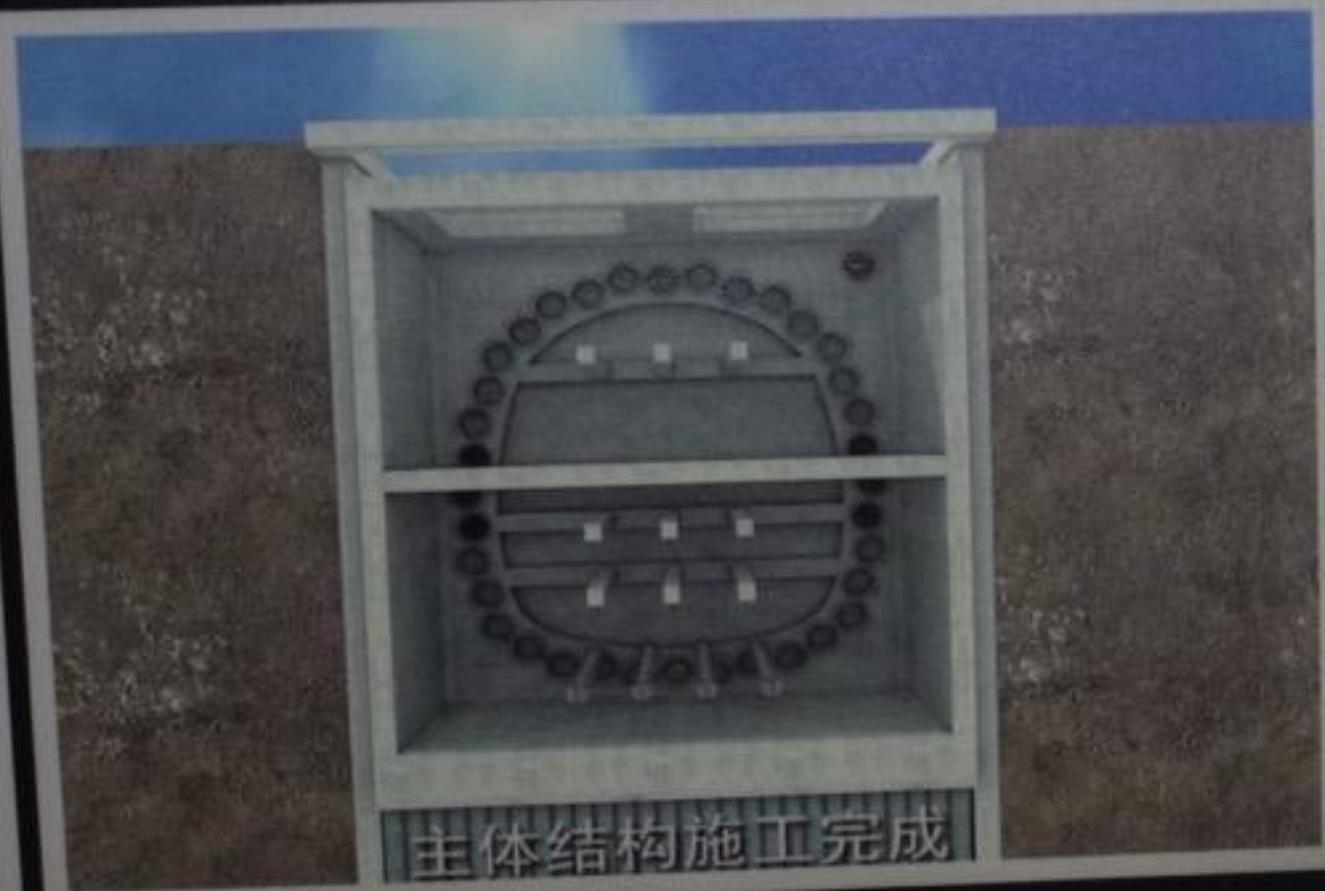


Paris, France





Zhuhai, China





Utilidors (Joint Utilities)

Joint Utilities – Wuhan, China





Existing water main
under stalls

Chongqing, China



Completed in 3 hrs. vs. 7 days

Shenyang, China – Pipe Ramming



Transfer all existing overhead H.T. underground due to road widening

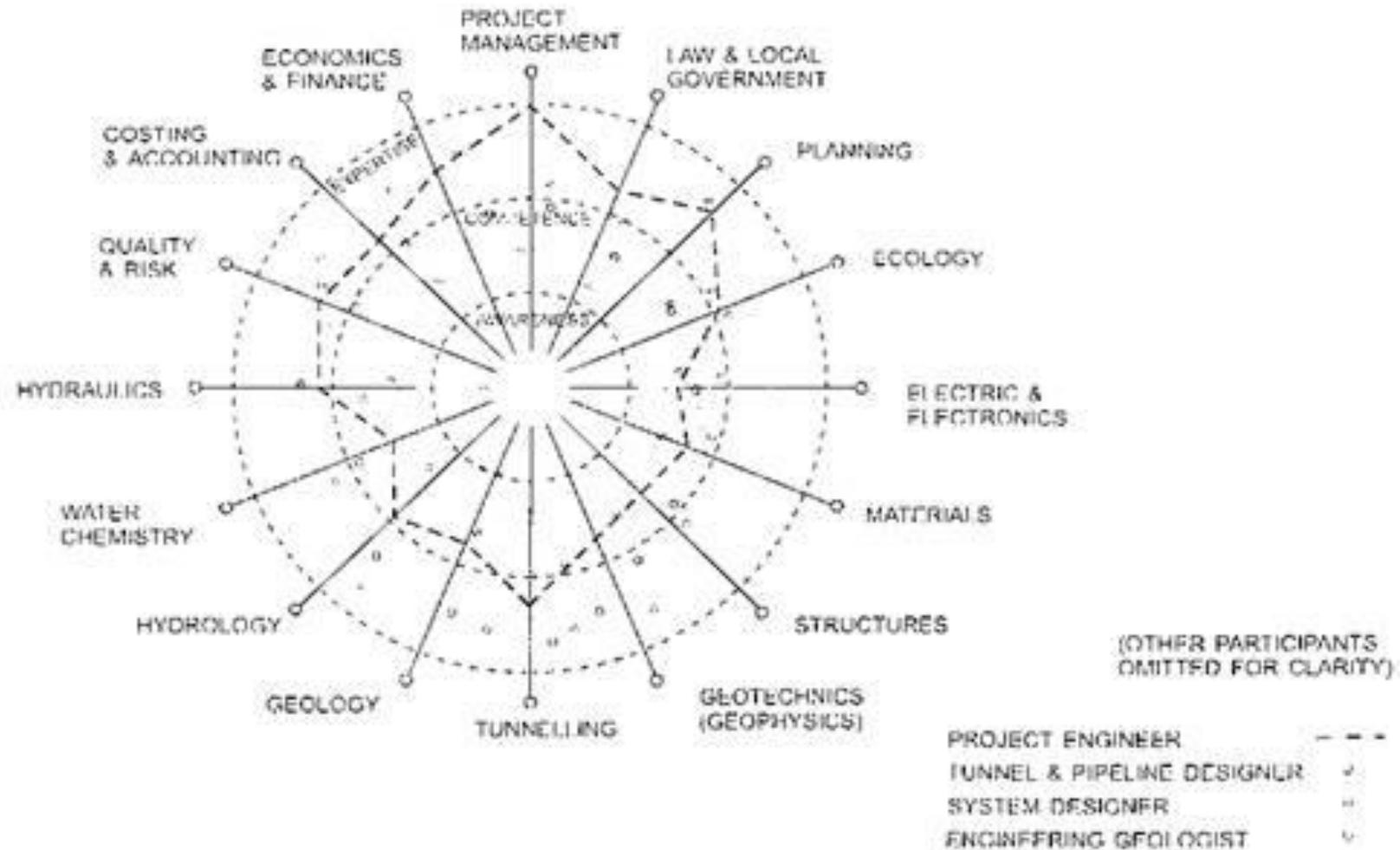
Ramming Pit

800mm casing under canal for H.T. cables

Second section
800mm casing under traffic
intersection

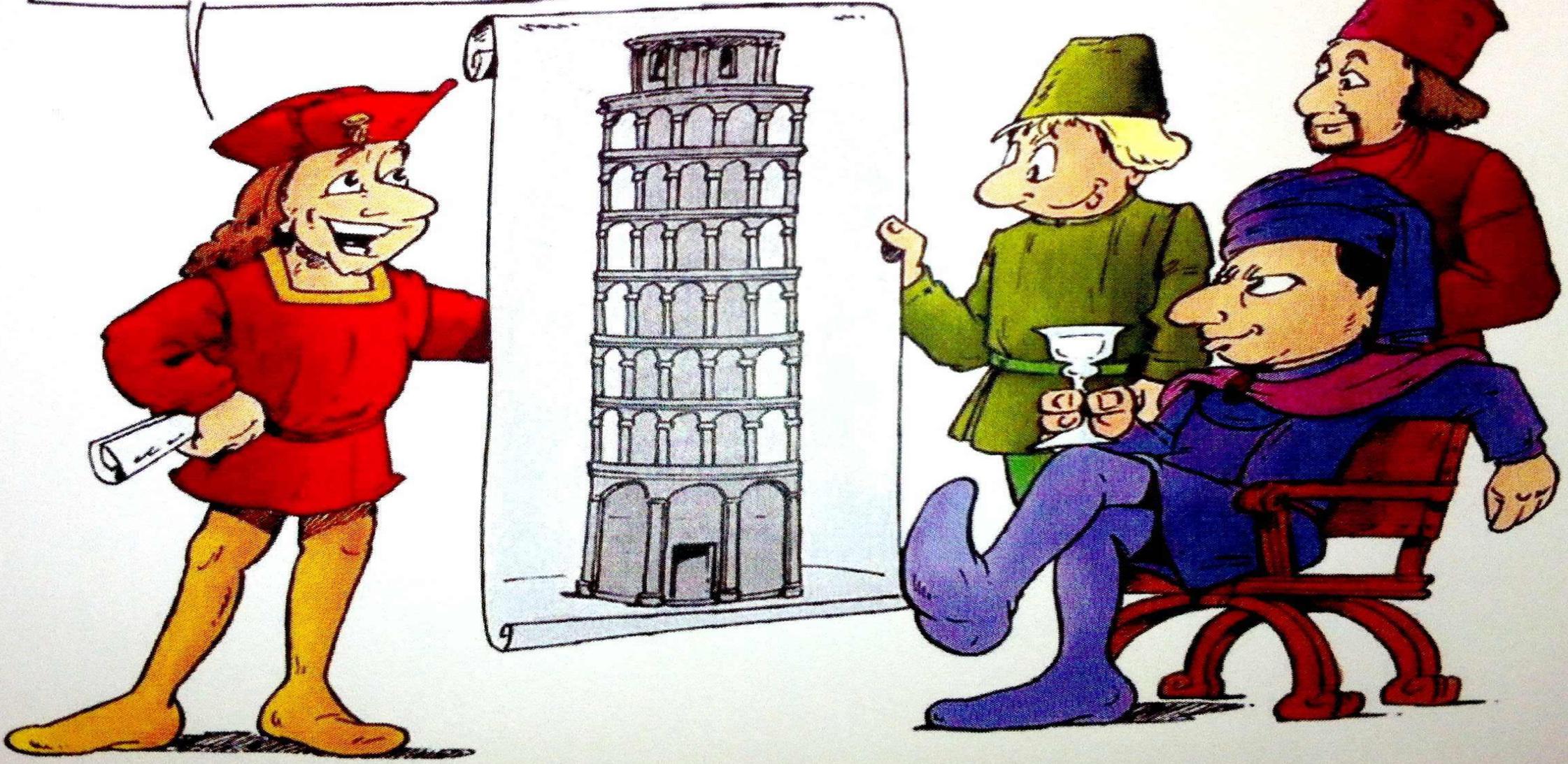


Interdisciplinary Skillset for Underground Engineering



Wood (2000)

... AND WE CAN SAVE 3 WEEKS
BY NOT MAKING SOIL TESTS...



Conclusions

- World-wide urbanization of metropolitan areas has resulted in the need for expanding our underground utility infrastructure
- Furthermore, aging utilities require rehabilitation
- Minimally-intrusive trenchless construction practices play an important role
- The utilization of trenchless technologies will continue to increase!



Grazie!





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