



# Go local: community networks

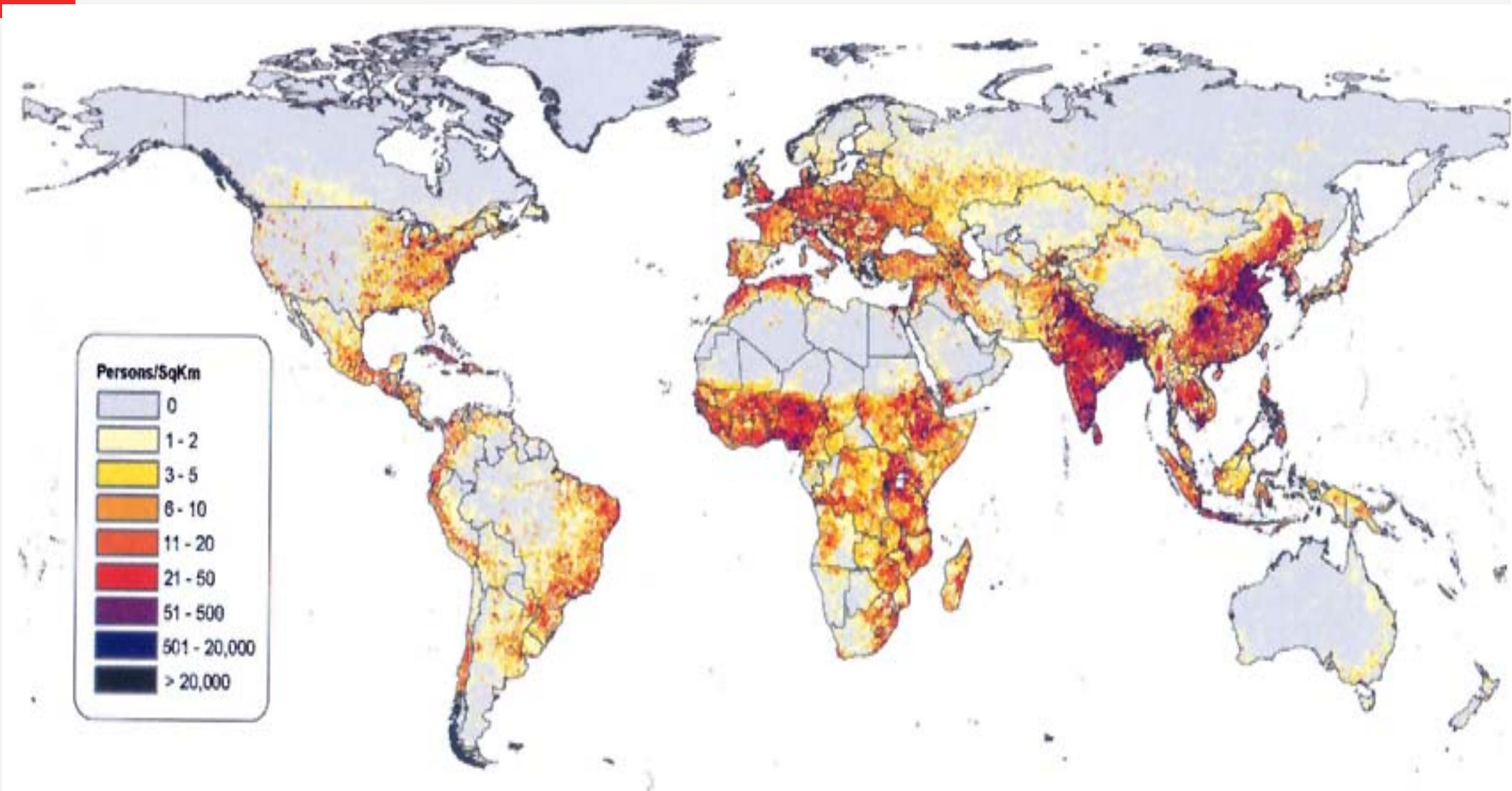
Leandro Navarro  
Leandro.navarro@upc.edu  
Barcelona

Supported by AmmbrTech, APC.org, Catalan gov, guifi.net,  
ISOC.org, netCommons.eu, Spanish gov

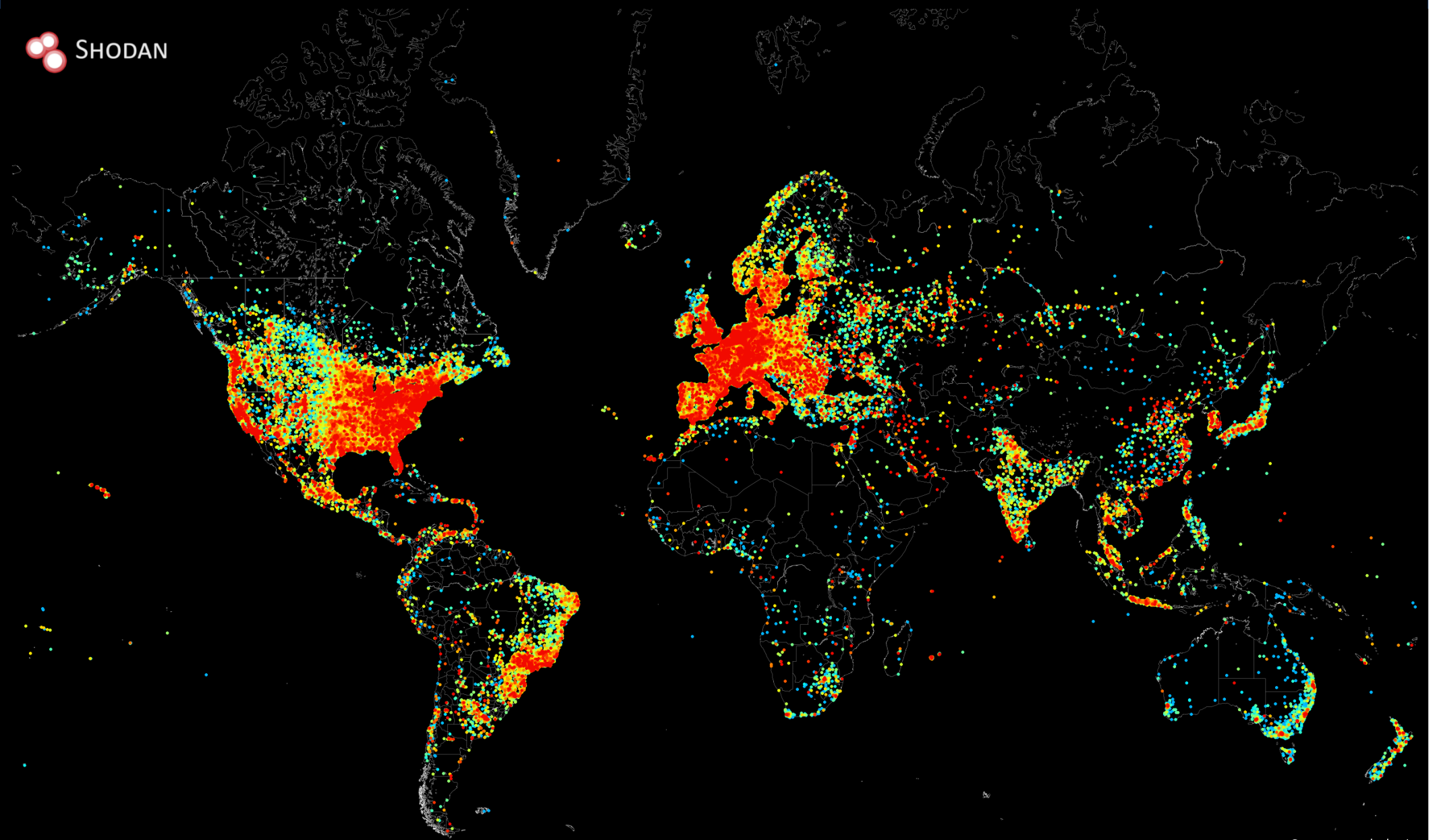


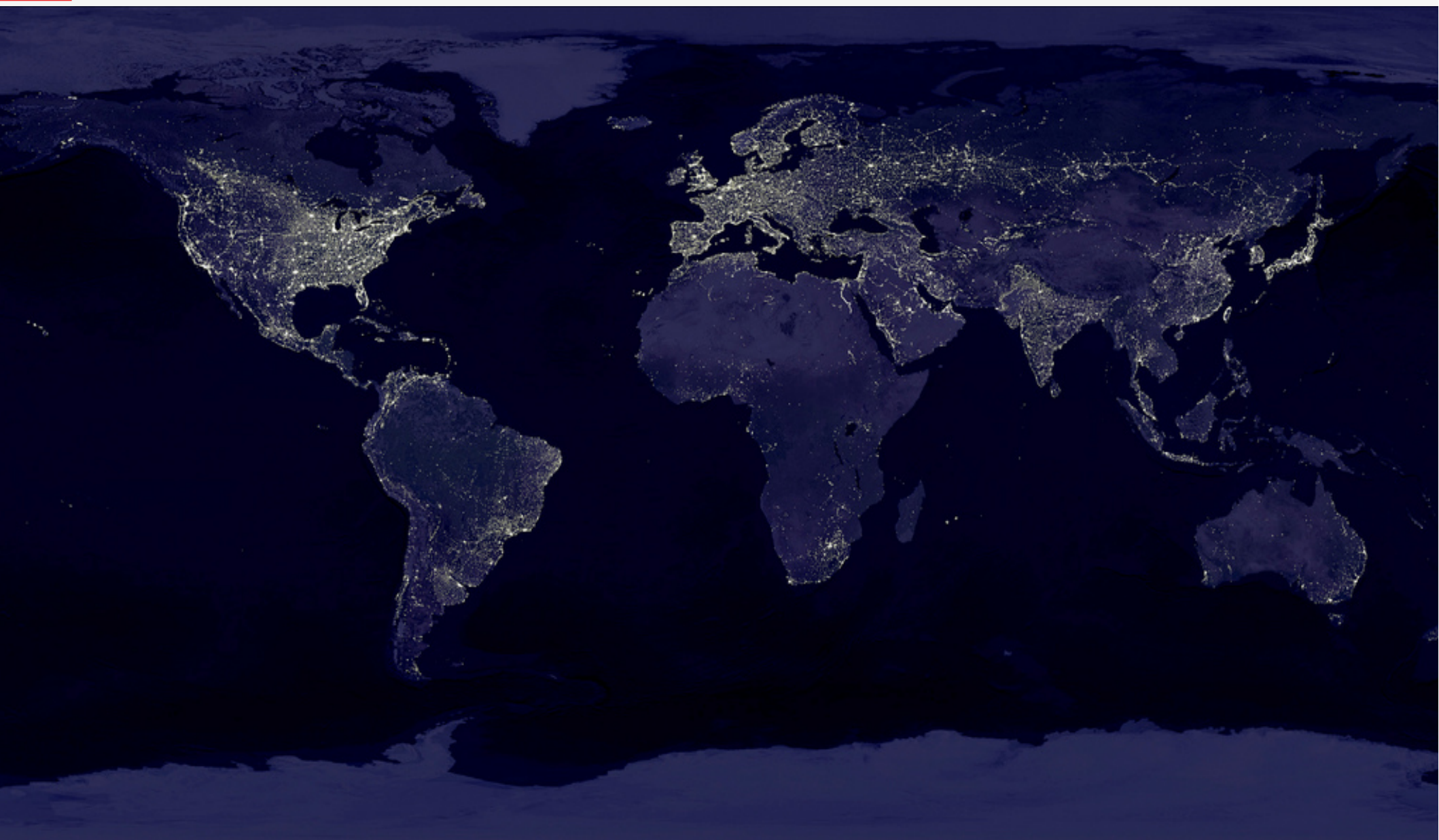
# Internet is for everyone (RFC 3271) Vint Cerf 2002

- Everyone has the right to communicate, access to information
- *Article 19. Everyone has the right to freedom of opinion and expression; this right includes freedom to hold opinions without interference and to seek, receive and impart information and ideas through any media and regardless of frontiers.*  
(Universal Declaration of Human Rights)
- Not everyone has access,  
not everyone can provide it



Source: FAO.org, ORNL LandScan 2000



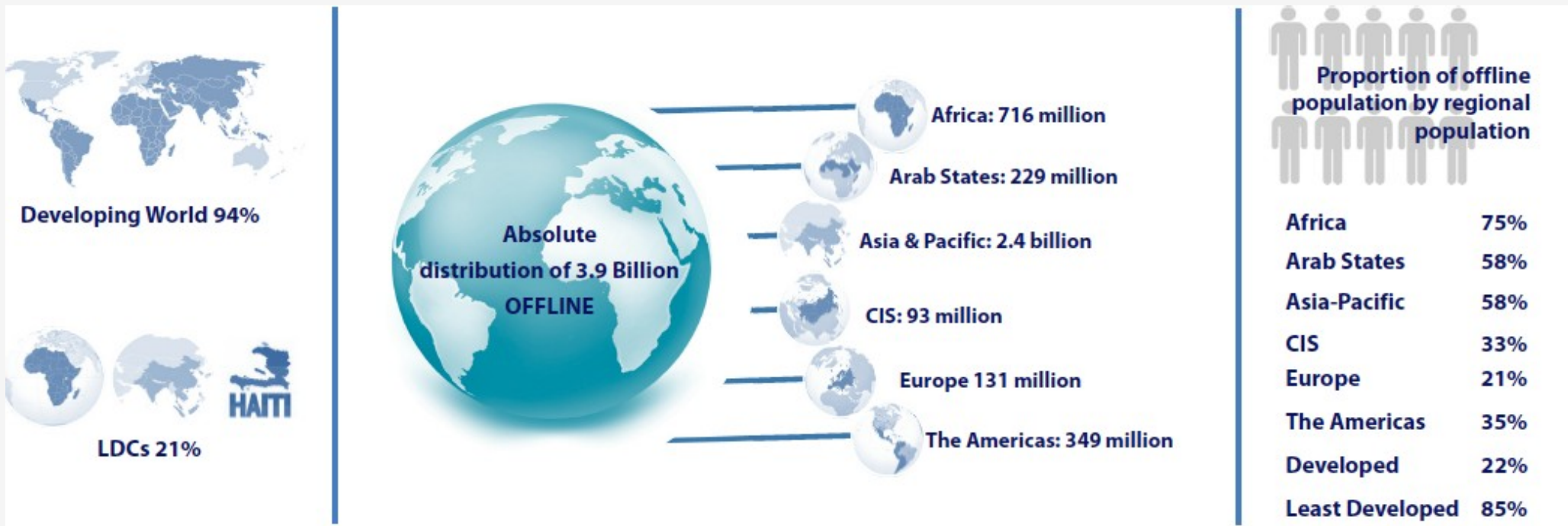


# Connectivity in local communities

- Universal service (ECC)
  - Right to a functional internet connection ... that is affordable and allows full engagement with the digital economy and society
- Urban: high population density and infrastructure
- Rural: not urban, not centres
- How to sustain connectivity and net services?
  - Business models & technology

# *Internet for everyone*

## Distribution of offline population

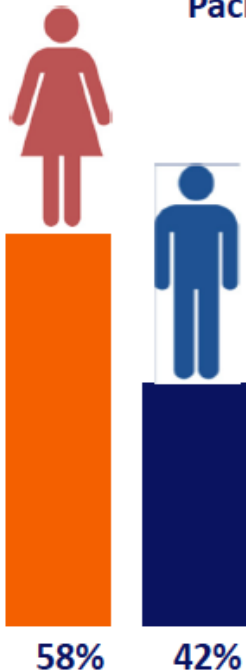


Source: ITU.int, International Telecommunications Union 2017

# Internet for everyone

## Offline population

The Gender Gap  
is most  
pronounced in  
Africa, the Arab  
States and Asia-  
Pacific



Half have a GNI/capita of < US\$ (PPP) 6,500, a large proportion of which are located in Africa and Asia-Pacific



60% live in rural areas, of which a large proportion is located in Africa and Asia-Pacific

The elderly have much lower Internet penetration levels than the overall population across all regions



Individuals with low educational attainment often remain unconnected across all regions



# The challenge

## World Economy

Big enterprises, financial institutions and the State: serves global markets.

## Local Market Economy

Small enterprises, self-employment: serves local needs.

## Subsistence Economy

Low market economic activity and informal activities: serves subsistence economy.

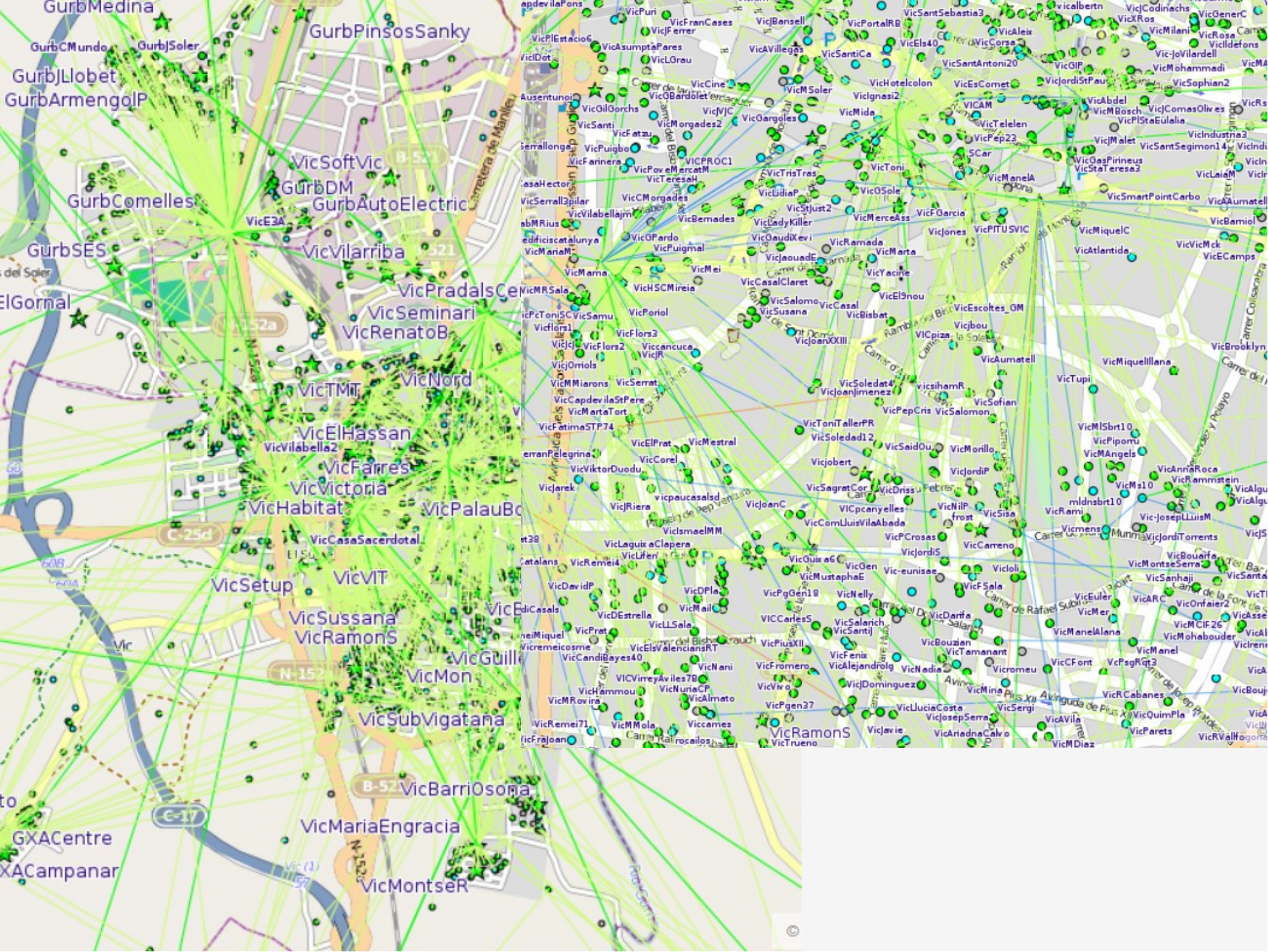
- Not only availability (offer), but also
- a dramatic reduction of cost (affordability),
- Provision:
- ... *(by & for) local or "extractive" economy?*
- Farms, fields, less or not profitable?
- Not only offering, but also local development:  
local provision = Self-provision



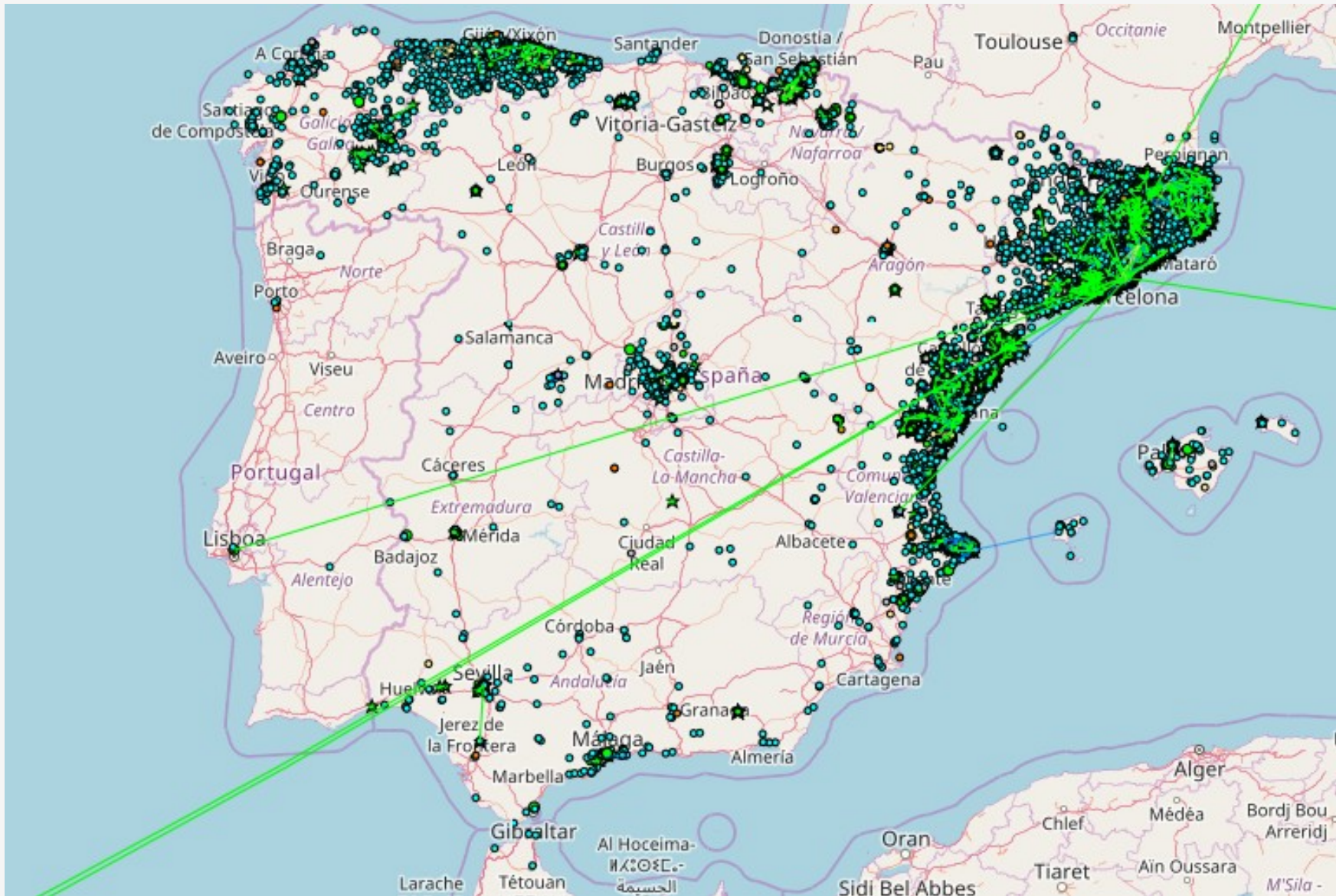
# Community networks

Crowdsourced networks built by citizens, that contribute and coordinate their own network devices to create a shared network infrastructure

- What technology? *wireless, fibre*  
commodity, mixed (standards, interop)
- What governance? *of a shared infrastructure*  
(cooperative, open to anyone, local Internets)
- Decentralized investment, management by everyone: volunteers, professionals, ...
- *Openness (participation, operation, services)*



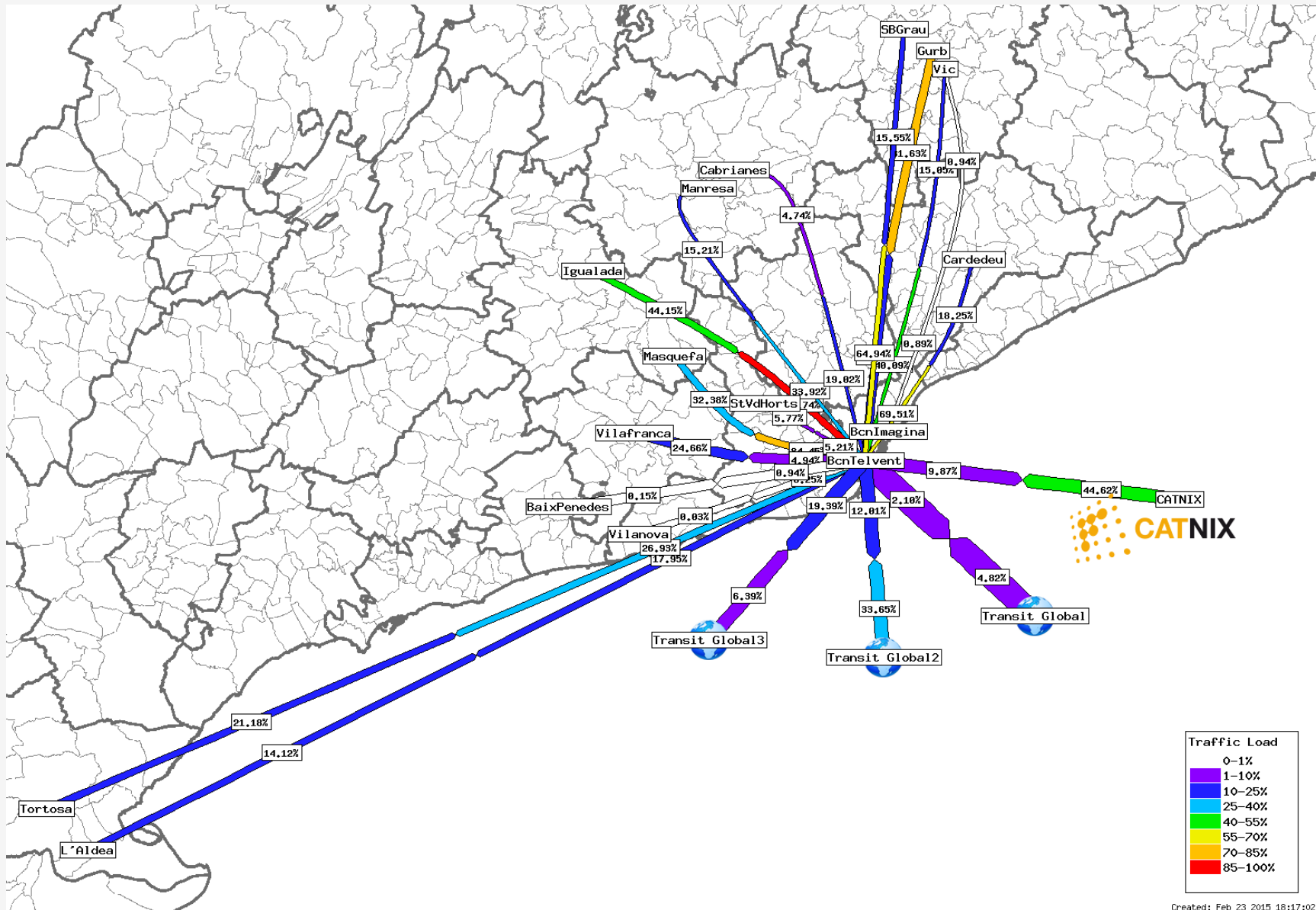
# guifi.net: many communities



# Self-service connectivity

- Connectivity (local+global) not everywhere
- Connectivity expensive to have (bring)
- Sometimes not feasible in commercial terms:  
the (licensed) “restaurant model” (*large operators*)
- Self-provided connectivity:  
the “[homemade](#) model” (*small operators, WiFi*)

# Regional backbone & Internet





# Governance

- Based on principles for governance of commons as common property (E. Ostrom)
- Aim: preserve local connectivity as a key resource for the community, avoid the “*tragedy of the commons*”
- Ensure right of access, participation, provision, benefits for all
- *All: individual citizens, professionals, private or public orgs ...*

# Business models

- Who does it?
  - One for all: a large operator (with license)
  - Wireless ISP (WISP): a local operator
  - Community networks: anyone in a community
- Differences in costs (*e.g. right of way, deployment, maintenance, local staff*) & ownership
- Technology comes bundled with business models: *Ethernet, ATM, GSM, 5G, WiFi, mesh, bitcoin ...*
- Infrastructure sharing: + complex, - expensive: *Open Access Networks, Internet eXchanges*

# Ingredients in Community nets

- Diverse, small Internets, experimentation:
  - Multiple AS, IPv6, routing protocols (BGP, OSPF, BMX6), unlicensed spectrum, diverse technology, (WiFi AP, WiFi P2P links, wireless mesh, fibre, anything ...)
  - Infrastructure sharing: Regional IX, decentralized net management, backhaul sharing, virtualization => software & services
  - Decentralized economic model: compensation, incentives, blockchain, cryptocurrencies



# ***Internet for everyone by everyone***

- Need for an open Internet, self-provision
- Small providers, need to cooperate to be effective in regional coverage, services
- Community networks: Local development, local connectivity, local business, local resilience
- Diversity, standards, interop, commodity components, incremental upgrade, decentralised
- *Connectivity for the next 50% will develop bottom-up*
- *The topic of the IRTF GAIA WG*