

**Infrastructural science:** a body of technical practices that enable material interventions by integrating theory-derived knowledge with standardized, routine observations.

Common Name	Object of surveillance	Material Interventions	Tools of Surveillance	Bodies of theoretical knowledge	Institution and Citation
Meteorology	Weather, Upper Atmosphere	Transport safety; power grid operations	Satellites, radars, radiosondes Thermometers,	Meteorology, thermodynamics, hydrodynamics	National Weather Service, NOAA (Turner 2010)
Aeronomy	ionosphere, magnetic fields	over the horizon radio communication	radio emitters and receivers	electromagnetic physics	Central Radio Propagation Laboratory (Popkin 1967)
Microbiology	food supply, drinking water	ready availability of edible food and potable water	bacteriological tests	bacteriology, micro-biology, epidemiology	Food Safety and Inspection Service, USDA; Local water services (Jain 2005)
Space weather	space environment, sun	satellite mediated telecommunication, transpolar flight	solar observing satellites	electromagnetic physics, solar physics, nuclear dynamics	Space Weather Prediction Center, NOAA (OFCM 2010)
Seismology	earthquakes	tsunami warnings, nuclear test detection	seismographs, water pressure sensors	geophysics, plate tectonics, seismology	Tsunami Warning Centers, NOAA (Powers 2005)
Physical Oceanography	ice bergs	great circle ocean routes, shipping safety	patrol ships, airplanes, satellites	physical oceanography, Glaciology, meteorology	International Ice Patrol (Rainger 2007)
Transportation ornithology	birds, bats, insects	clearing wildlife hazards near airports and roads	binoculars, radar, pilot reports	ornithology, ecology	Wildlife Strike Database, FAA (Cleary and Dolbeer 2005)
Economic entomology	agriculturally important insects	productive food and fiber crops	traps, damage surveys, insurance reports	Zoology, plant physiology	Bureau of Economic Entomology, USDA (McWilliams 2012)
Fisheries management	oceanic animal populations	sustainable harvesting of seafood	surveys, inspections, reports	population biology, oceanography, economics	National Marine Fisheries Service, NOAA
Epidemiology	Populations	controlling disease, improving public health	hospital reports, standardized diagnostic criteria	Medicine, physiology, cultural ecology	Bureau of Animal Industry, USDA (Olmsted and Rhode 2015)
Hydrology	river and stream volumes	preventing, controlling and predicting floods	stream gauges, rain gauges	hydrology, hydrometeorology	NWS River Forecast Centers (Bradley 2010)
Vulcanology	volcanoes	eruption prediction for evacuation and safe overflights	seismographs, gas chemistry, satellite pictures	Geology, meteorology	International Airways Volcano Watch, ICAO/WMO (WOVO 2009)
Forestry	Trees, watersheds, wildfire	Production of building materials and fuel	Watch towers, measuring tools	Botany, ecology, mathematics	Forest Service (Pyne 1982 and 1984)
Operations research	flows and stocks	efficient movement and production	surveys, reports, transponders, maps	applied mathematics, topology, algorithm design	
Metrology	weights and measures	interchangeable commodities and manufactured goods	Inspection agencies, calibration depots	Physics, chemistry	National Bureau of Standards, ISO (Busch 2011)
Macroeconomics	national/international economy	maintain/create patterns of trade and wealth distribution	surveys	macroeconomics, psychology	Federal Reserve Bank (Axilrod 2013)
Astronomy	Heavenly bodies, Time	Navigation	Telescopes, satellites, astrolabes, sextants	Gravitational Dynamics, trigonometry	Royal Greenwich Observatory (Croarken 2003)

# A Field Guide to Infrastructural Science

## Identifying Marks

*Work Practices: Formulaic and Routine*

Repetitive observation

Standardized procedures

Filling in preprinted forms

*Spatial Arrangement: Observation Networks*

Network of Observation Stations

Connected to Centers of Calculation

Dependent upon reliable communications systems

May monitor people as well as nature

## Range and Habitats

Abundant in government agencies (local and national)

Locally Common in industrial sectors concerned with flow  
(transport, energy, communications, e.g.)

Transient to Rare in research universities

*Often seen following herds of infrastructure managers*

## Habits and Behaviors

*Culturally Modest*

Quietly pervasive, not spectacular

Avoid metaphysical or cosmological claims

Rarely are “ascendant fields of intellectual high culture”

Not prized by historians of science

*Temporal Orientation: The Future*

Make predictions and forecasts

Build models and simulations

*Primary Function: Assist Managers*

Produce utilitarian rather than ornamental knowledge

*Key Product: Public Goods*

Forecasts, predictions, status reports

Standards for metrology

Usually distributed as texts

*Connections to Theoretical Science*

Theory guides observation

Routine observational data sometimes repurposed for  
discovery work

Infrastructure problems can inspire theorizing

Industrial needs justify academic training programs

*Invisibly Affect What We Can See*

Once built, they become invisible

But they affect what we can observe and discover