

Index

A

- Aerosol Robotic Network (AERONET), 177–179
- Amateur naturalists, 76
- Amateur science, 71. *See also* Citizen science
- Amateur scientists, *see* Citizen scientists
- Amazon Elastic Compute Cloud (EC2), 21
- Amazon Web Services (AWS), 21
- Application Database (AppDB), 57–58
- Application Programming Interfaces (APIs), 10–11, 134, 220
- ArcGIS
 - BigData, 304–305
 - GeoAnalytics Server, 306–307
 - GeoEvent Server, 307
 - Image Server, 305–306
 - SOAP and REST interfaces, 304
 - SSE project, 307–308
 - Web AppBuilder, 308
- ArcGIS Online, 303
- Archaeology, 75, 77
- Archived images, 257
- Artificial-intelligence technique, *see* Inductive learning, Wadden Sea water-quality
- Asynchronous JavaScript and XML (AJAX), 220
- Atmospheric chemistry, 175

B

- Band ratios, 148
- Berkeley Open Infrastructure for Network Computing (BOINC), 78
- Big Data
 - ArcGIS, 304–305

- citizen science, 83
- crop yield measurement, 290–291
- GEOSS (*see* Global Earth Observations System of Systems (GEOSS))
- light tracking, 286–287
- LULC mapping, 247
- poverty tracking, 287–290
- Senegal flood vulnerability, 293, 295, 297
- Biomass, 265
- Bodélé depression dust event, 183, 200–201
- Bolivia and Chile Salt flats dust event, 199
- Brokering approach, 133–134

C

- Call detail records (CDR), 238, 294
- Chlorophyll, 265
- Chromophoric dissolved organic material (CDOM) absorption, 191–193
- Citclops Data Explorer, 312, 313
- Citizen Observatory WEB (COBWEB) project, 81
- Citizen science
 - citizen cyberscience
 - passive sensing, 75, 78–79
 - personal computing devices, relies on, 77–78
 - volunteer computing, 75, 78
 - volunteer thinking, 75, 78
 - community science
 - civic science, 71, 75, 76, 80
 - DIY science, 76, 80
 - participatory sensing, 75–76, 79–80
 - definition, 71
 - and EO integration

- Citizen science (*cont.*)
 policy, 83–84
 societal and ethical aspects, 82–83
 technical aspects, 80–82
 long-running citizen science
 archaeology, 75, 77
 definition, 75
 ecological and biodiversity
 observations, 75, 76
 weather and meteorological
 observations, 75–77
 recognition and use of the term, 71
 sensors, 312, 313
 societal and technological trends
 cheap sensors, development and
 proliferation of, 73–74
 educated and able retirees, growth in,
 72
 education levels, growth in, 72
 participants, demographics of, 74
 Web and mobile communication,
 growth of, 72, 73
 VGI, 220
- Citizen scientists
 in acid-rain awareness raising campaign, 71
 domain-specific terms, 71
 Moonwatch project, 70
 professional scientists, collaboration with,
 70–71
- CitySurf Globe, 222
- Civic science, 71, 75, 76, 80
- ClimatePrediction.net project, 78
- Climate Science Data Service, 103–105
- Cloud computing
 API Economy, 9
 business models
 Amazon Web Services (AWS), 21
 Google's Cloud Platform, 22
 Microsoft Azure, 19–20
 cloud solutions, 19
 commercial cloud, 7, 9
 definition, NIST, 6
 delivery options, 8
 DigitalGlobe, 9
 distributing technology, 19
 earth observation data analysis, 271, 272
 IaaS, 7, 8
 industry, 4
 infrastructure, 5
 interoperability, 8–9
 legacy models, enterprise computing, 19
 PaaS, 7
 SaaS, 7
- CloudEO, 14, 255, 260
- Cloud Hub model, 55
- Cloud Management Framework (CMF), 58
- Cluster computing, 144
- Coastal and Marine Ecological Classification
 Standard (CMECS), 201–203
- Common Data Model (CDM), 234
- Community science
 civic science, 71, 75, 76, 80
 DIY science, 76, 80
 participatory sensing, 75–76, 79–80
- Computational intelligence (CI) methods, 188
- Compute to Global Memory Access (CGMA),
 151
- Compute Unified Device Architecture
 (CUDA), 150–151
- Content delivery networks (CDNs), 10
- Contributed Geographic Information (CGI),
 220
- Convolutional neural network (CNN), 274
- Copernicus, 262
- Coverage data model, 96
- Crowd4Sat project, 81, 82
- Crowdsourced science, 71
- Crowdsourcing, 6, 73
 citizen science, 17
 Galaxy Zoo, 18
 Geo-Wiki project, 17
 science and mapping-related projects, 17
 VGI, 16
- Cyber-infrastructure (CI)
 architectural challenges, 144
 distributed, real-time and cluster
 computing, 144
 GPGPU, 144
 modularity, 144
 SMT00L (*see* Settlement Mapping Tool
 (SMT00L))
 TUMS (*see* Toolbox for Urban Mobility
 Simulations (TUMS))
 UrbIS (*see* Urban Information System
 (UrbIS))
- D**
- Dartmouth Flood Observatory, 294
- Data as a service (DaaS), 6, 10–11
- Data assimilation, 263
- Datacube, EarthServer
 flexible, scalable EO services, 93
 GEOSS “system of systems” approach, 115
 Google Earth Engine, 115
 intercontinental datacube mix and match,
 93, 94
 ISO and INSPIRE, 98

- metadata management, 112–113
 - rasdaman
 - Array Database, 109
 - array processing, 109–111
 - array storage, 109, 110
 - tool integration, 111–112
 - Science Data Services
 - Climate Science Data Service, 103–105
 - Cross-Service Federation Queries, 107–108
 - Earth Observation Data Service, 99–102
 - LandSat service, 99
 - Marine Science Data Service, 101–103
 - partners, 99
 - PSDS, 105–108
 - SciQL, and SciDB, 115
 - SOS, 115
 - spatial and temporal dimensions, 93
 - SQL/MDA, 116
 - standards-based modelling
 - coverage data and service model, 96, 98
 - ISO and INSPIRE, 98
 - regular and irregular spatio-temporal grids, 94–95
 - WCPS, 93, 95, 97–98
 - WCS suite, 93, 95–98
 - virtual globes, 114–115
 - Data, Information, Knowledge, Wisdom (DIKW) model, 135–136
 - Decision support systems, 312
 - Decision trees, 313–314, 319
 - Deepwater Horizon (DWH) oil spills, 210–211, 213
 - Dense Scale Invariant Feature Transform (DSIFT), 147
 - Digital Earth (DE)
 - geobrowsers, 222
 - multi-resolution, 222
 - Digital Elevation Models (DEMs), 221
 - Digital Terrain Models (DTMs), 227
 - Digital transformation, EO education
 - emotional engagement, 28–29
 - environmental stewardship, 26
 - interactive web technologies, 26
 - “learning design” process, 26
 - MOOCs (*see* Massive open online courses (MOOCs))
 - OER movement, 26
 - online education, 26
 - open online distance education, 29
 - social learning, 29
 - traditional modes of delivery, higher education, 29
 - Disaster risk reduction, *see* Senegal flood vulnerability
 - Discovery and Access Broker (DAB), 134
 - Disruptive innovation, 6, 18
 - Do-It-Yourself (DIY) science, 76, 80
 - Dust sources, 194, 196–199, 201
 - Dynamic land use model, 251
 - Dynamic mapping, 248
- E**
- EarthBrowser, 222
 - Earth3D, 222
 - Earth Observation Data Centre for Water Resources Monitoring (EODC)
 - aim, 275
 - ground measurements, 276
 - human impacts, 276
 - infrastructure, 278
 - pilot services, 279–280
 - public–private partnership, 276, 277
 - Sentinel-1 data services, 280, 281
 - ultimate goal, 279
 - Earth Observation Data Service, 99–102
 - Earth Observation High performance Computing (EO-HPC) systems, 144
 - EarthServer, Datacube
 - coverage data and service model, 96, 98
 - flexible, scalable EO services, 93
 - GEOSS “system of systems” approach, 115
 - Google Earth Engine, 115
 - intercontinental datacube mix and match, 93, 94
 - ISO and INSPIRE, 98
 - metadata management, 112–113
 - rasdaman
 - Array Database, 109
 - array processing, 109–111
 - array storage, 109, 110
 - tool integration, 111–112
 - regular and irregular spatio-temporal grids, 94–95
 - Science Data Services
 - Climate Science Data Service, 103–105
 - Cross-Service Federation Queries, 107–108
 - Earth Observation Data Service, 99–102
 - LandSat service, 99
 - Marine Science Data Service, 101–103
 - partners, 99
 - PSDS, 105–108
 - SciQL, and SciDB, 115
 - SOS, 115
 - spatio-temporal datacubes, services for, 93

- EarthServer, Datacube (*cont.*)
 SQL/MDA, 116
 virtual globes, 114–115
 WCPS, 93, 95, 97–98
 WCS suite, 93, 95–98
- EGI Blueprint
 advanced computing services, 55
 architecture, 55–56
 Cloud Infrastructure Platform, 55
 Collaborative Platform, 56–58
 Community Platforms, 56
 Core Infrastructure Platform, 55–57
 Data Hub, 59–60
 EGI Federated Cloud, 58
 Open Data platform, 55, 59–60
- Enterprise resource planning (ERP), 271
- Environmental stewardship, 26
- Environment Space and Time Web Analyzer (EST-WA)
 architecture, 234, 235
 CDM, 234
 EST-WA2D, 234–236
 EST-WA3D, 234, 235
 sectioned model and section profile graphic, 237–238
 voxel structure and cutting planes, 236–237
 netCDF Java library, 234
 SMSs, visualization of, 238–239
 spatio-temporal variable distributions, visualization of, 234
- ESA Climate Change Initiative Soil Moisture project, 280
- ESA OC-CCI project, 101–102
- Esri Story Map, 304
- EU FRESHER project, 249
- European Association of Remote Sensing Companies (EARSC), 3–4
- European Centre for Medium-Range Weather Forecasts (ECMWF), 99, 103–105
- European Citizen Science Association (ECSA), 82
- European Open Science Cloud (EOSC)
 cross-domain ICT e-Infrastructures, 48
 definition, 48
 domain-specific European Research Infrastructures, 48
 EO data exploitation via the e-Infrastructures
 computing and storage resources, 61
 Copernicus programme, 60, 61
 data consumers, 61
 ESA Generic Exploitation Platform Open Architecture, 62–64
 Geohazard Exploitation Platform, 64–65
 ICT experts and platforms operators, 61
 reusable components, 60
 role of, 61, 62
 European Commission Digital Single Market strategy, 47
 FAIR principles, 48
 guiding principles, 48
 Open Science Commons (*see* Open Science Commons)
- European Research Area (ERA)
 EOSC (*see* European Open Science Cloud (EOSC))
 European Council, 44
 implementation actions, 44
 Open Infrastructures for Open Science, 44
 Open Science Commons (*see* Open Science Commons)
 problems to solve
 access to data and knowledge, 45
 insufficient cooperation between public and private sector, 45
 lack/incomplete roadmaps for Research-and e-Infrastructures, 45
 lack of national and european organization between stakeholders, 45–46
 many providers without a single market, 46
 Research Infrastructures, 44
 European Space Agency (ESA), 27, 38
- Execution environment, 63
- Eye on Earth Alliance, 84
- F**
- “Fabspace 2.0” project, 32
- Farm Management Information System, 267
- Fertility, 263
- Fertilization, 267
- Findable Accessible Interoperable and Reusable (FAIR) data and services, 48
- Flood vulnerability assessment, *see* Senegal flood vulnerability
- Food security, 261
- Food security TEP, 266
- Footprint, 272, 273
- Forel-Ule (FU) water colour scale model, 315–319
- Foursquare, 249–251
- FutureLearn platform, 27

G

Galaxy Zoo, 18, 78
 GeoGlobe, 224
 Geographic Information Science and Technology (GIST), 144
 Geohazard Exploitation Platform (GEP), 64–65
 GEOinformation for Sustainable Development Spatial Data Infrastructure (GEOSUD SDI), 14
 GeoSharing
 archived images, 257
 expert knowledge, 257–258
 platform requirements
 commercial and legal access, 259–260
 technical access, 258–259
 unused or underused resources, 256–257
 Geospatial information markets
 Big Data, 4
 Copernicus, 3
 data value chain, 4, 5
 ESA's Sentinel satellite constellation, satellite data, 5
 European Commission's Digital Single Market Package, 4
 key drivers of change, 5
 crowdsourcing (*see* Crowdsourcing)
 DaaS, 6, 10–11
 disruptive innovation, 6, 18
 new business models, 6, 14–15
 open data policies (*see* Open data policies)
 rise of the platforms (*see* Cloud computing)
 sensor use growing, 6, 15–16
 remote sensing data, 5
 SMEs, 5
 Geospatial software, 302. *See also* ArcGIS
 Geospatial Web (GeoWeb)
 definition, 219
 GeoWeb 2.0, 219
 Web mapping applications, 219–220
 GEOSS Common Infrastructure (GCI)
 Big Data challenges, strategies and solutions, 130–132
 components, 129–130
 core services, 129
 Geo-statistics, 262
 Geotagging, 73
 Geo-Wiki project, 17, 224
 Global Biodiversity Information Facility (GBIF), 76
 Global Earth Observations System of Systems (GEOSS)

 brokering approach, 133–134
 collaborative communities, 302–303
 DAB, 134
 Data-CORE, 129
 DIKW pattern, 135–136
 GCI
 Big Data challenges, strategies and solutions, 130–132
 components, 129–130
 core services, 129
 GEOSS Knowledge Base, 136–137
 high-performance analytics, 137–138
 users' requirements and feedbacks, 135
 10-Year Implementation Plans, 128
 Global Positioning System (GPS), 73
 Globus Toolkit GridFTP, 158
 Google Earth, 221, 223, 224
 Google Earth Engine, 115, 293, 295
 Google Maps, 22
 Google's Cloud Platform, 22
 Gray Level Co-Occurrence Matrix (GLCM)
 Contrast, 147
 Great Acceleration period, 276
 Group on Earth Observation (GEO), 128
 Data Management Principles, 129
 Data Sharing Principles, 129

H

Human activity patterns, 249, 252
 Hyper-spectral imaging, 206–211

I

India Nightlights platform, 288
 Inductive learning, Wadden Sea water-quality class classification problem, 316
 data description, 314–315
 decision trees, 313–314, 319
 Earth observations, 315
 FU scale model, 315–319
 Information driven smart farming, 261–262
 Infrastructure as a Service (IaaS), 7, 8
 “Innovations in Big Data Analytics” program, 286
 INSPIRE Directive (2007/2/EC), 126–128
 Insurance, 272–274
 International Geophysical Year (IGY), 69, 70
 International Space Station (ISS), 14
 “Interpretative” planning approach, 125

J

Java Web Start (JWS) technology, 227
 Jupyter Notebooks, 163

K

- Knowledge sharing and open science
 - challenge, 125–126
 - conceptual framework and rationale, 126
 - INSPIRE Directive (2007/2/EC), 126–128
 - supportive information infrastructure, 126

L

- Landsat explorer web application, 305, 306
- Landsat's complete data archive, 262
- LandScan Population Cells (LPC), 155
- Land use and land cover (LULC) mapping
 - big EO data, 247
 - human activity patterns, 249, 252
 - LBSN, 252
 - settlements, 145
 - spatio-temporal decision support, 248, 249, 252
 - temporal granularity, 248
 - timeliness, 248
 - VGDI
 - Foursquare API, 250–251
 - venue data, 250, 252
 - VGI, 248, 249, 252
 - Virtual globes, 224
- Leaf Area Index (LAI), 265
- “Learning design” process, 26
- Leverages Limited Error Raster Compression (LERC), 305
- Light tracking, 286–287
- Link-based visualization tool, 153
- Location-based social network (LBSN), 249, 252
- Locked-in expert knowledge, 257–258
- Logistics, 265
- Long-short-term memory (LSTM), 274
- Low-end disruptive innovations, 18

M

- Machine learning
 - algorithms, 167
 - applications, 166
 - bias correction and cross calibration, 167–168
 - AOD bias correction, 179–181
 - atmospheric ozone depletion, 171–175
 - MODIS aerosol optical depth, 176–180
 - vegetation indices, 168–170
 - definition, 165
 - dust source identification, 196–201
 - empirical approach, 166
 - HCl and Cl₂ time series, 175–176

- hyperspectral imaging systems, 206–211
- new product creation
 - airborne particulates, 181–184
 - CH₄–N₂O correlations, reconstruction of, 185–187
 - pollen estimation, 187–188
 - tracer correlations, 184–185
- ocean data products, 191–195
- oil spills, 210–213
- open source tools, 166
- pelagic habitats classification systems, 201–206
- tasks, 167
- Marine Science Data Service, 101–103
- Marketplace, 57
- Massive open online courses (MOOCs)
 - active learners, 27
 - big data revolution, 31
 - calibration and validation questions, 33
 - citizen science, 32
 - “Connectivism and Connective Knowledge” course, 29
 - “crowd-sourcing” approach, 32
 - data applications, 27
 - digital networked learning, 29
 - emotional engagement, 27
 - ESA, 27
 - “Fabspace 2.0” project, 32
 - “instructional genre,” 33
 - “Introduction to Artificial Intelligence” course, 29
 - knowledge transfer, 31
 - MIT's Open Course Ware initiative, 29, 30
 - “Monitoring Climate from Space,” 27–28 and OER, 28, 31
 - OLC (*see* Open Learning Campus (OLC))
 - online and video-led professional development training, 31
 - personalization, 30
 - rudimentary training, 27
 - school-based education, 31–32
 - social learners, 27
 - tools and format, 33
- Metadata management system
 - federated operation, 112
 - in situ operation, 112
 - xWCPS 2.0, 112–113
- Metadata search, 157–158
- Meta Raster Format (MRF) file format, 305
- Meteorological Archival and Retrieval System (MARS), 103
- Meteorology, 70
- Micro-services, 271
- Microsoft Azure, 19–20

- “Missing Maps” project, 78
- Mobile communication, 73
- Moderate resolution imaging spectroradiometer (MODIS) algorithm, 177–179
- Moonwatch project, 70
- Multidimensional Arrays (MDA), 116
- Multidimensional data, 302
- Multidimensional earth observation, 302

- N**
- NASA Atmospheric Science Data Center (ASDC) Portal, 308, 309
- NASA Earth Exchange (NEX), 21
- National Academy of Sciences, 210
- National Ambient Air Quality Standards (NAAQS), 182
- National Institute of Standards and Technology (NIST), 6
- National Oceanic and Atmospheric Administration (NOAA)’s Defense Meteorological Satellite Program, 287
- NDVI, *see* Normalized differenced vegetation index (NDVI)
- Network Common Data Form (NetCDF), 233
- Neural network technologies, 273, 274
- New business models, 6, 14–15
- New-market disruptive innovations, 18
- Newton-Raphson based recursive Random Forest technique, 190
- NEXRAD radar parameters, 189–190
- Nightlights.io platform, 287
- Non-professional scientists, *see* Citizen scientists
- Normalized differenced vegetation index (NDVI), 273, 274
- Numerical Weather Prediction (NWP), 103, 263

- O**
- Ocean color, 191
- Oil spills, 210–213
- Oil thickness chart, 212
- On-farm research techniques, 265
- Open Data Kit (ODK), 225–226
- Open data policies, 5, 6
 - Copernicus programme of Sentinel satellites, 11
 - data gravity, 13
 - GPS, 11–12
 - Marketplace, 12
 - mobile applications, 13–14
 - mobile devices, 13
 - official weather data, 12
 - vending machine model, 13
- Open data portal, 304
- Open educational resources (OER), 26, 28, 31, 35
- Open Geospatial Consortium (OGC), 220
- Open Infrastructures for Open Science, 44
- Open Learning Campus (OLC)
 - array of learning tools, 31
 - “bitesize” learning resources, 30
 - face-to-face training, 30
 - full-scale MOOCs, 30
 - short “e-courses,” 30
 - WBG
 - flexible pathways to learning, 36–37
 - geospatial data, 37–38
 - geospatial data sharing and visualisation, 34
 - incorporating spatial data, 38–39
 - issues and messages, 39–40
 - learning as an accelerator to achieve development goals, 34–35
 - progress, 35–36
- Open Science, 46–47
- Open Science Commons
 - definition, 46
 - EOSC
 - architecture and services, 49–52
 - EGI Blueprint (*see* EGI Blueprint) and e-Infrastructure Commons, 54–55
 - governance, 52–54
 - Open Science “trends,” 49
 - ideas, 46–47
 - pillars, 47
- OpenStreetMap (OSM) project, 78, 151, 152
- Origin-destination (OD) tables, 153–155

- P**
- Participatory science, 71, 298
- Participatory sensing, 75–76, 79–80
- Passive sensing, 75, 78–79
- Pathfinder Innovation Contest, 20
- Pattern recognition, 263
- Peta-scale earth observation imagery, 145
- Phenological development, 266
- Planetary Science Data Service (PSDS), 105–108
- PlanetServer, *see* Planetary Science Data Service (PSDS)
- Plant protection, 267
- Platform as a Service (PaaS), 7, 19

- Points of Interest (POIs), 226
- PoliCrowd
 - functionalities, 228–232
 - NASA World Wind Java SDK, 226–227
 - ODK suite, 225–226
 - open source software, 225
 - system architecture, 227–228
- Population dynamics, 248
- “Positivist” model, 124
- Post-modernisms, 124
- “Post-normal science” (PNS), 125
- Poverty tracking, 287–290
- Precision farming, 261
- Professional scientists, 70
- PROMET crop growth model, 264–266
- Public Laboratory for Open Technology and Science, 80
- Public Participation in Scientific Research (PPSR), 71

- Q**
- QGIS Globe, 222
- Quake Catcher Network (QCN), 79

- R**
- Radiative transfer models, 267
- Raster GIS analytics, 306
- Reflective planning approach, 124–125
- Remote sensing and machine learning, 165–168
 - CDOM absorption, 191, 193
 - dust sources, 196
 - DWH oil spills, 210, 211, 213
 - habitat classification systems, 201
 - pollen estimation techniques, 188
 - vegetation index values, 170
- Remote sensing based tools, *see* Senegal
- “Remote Sensing Science 2.0,” 247
- Reproducibility vs. replicability, 123–124
- Research Data Alliance (RDA), 122–123
- Resource management, 63
- REST interface, 304

- S**
- SAP HANA Earth Observation Analysis, 272
- Satellite-based yield measurement, 290–291
- Scalable Satellite-based Crop Yield Mapper, 291
- SciDetect, 123
- Science Data Services
 - Climate Science Data Service, 103–105
 - Cross-Service Federation Queries, 107–108
 - Earth Observation Data Service, 99–102
 - LandSat service, 99
 - Marine Science Data Service, 101–103
 - partners, 99
 - PSDS, 105–108
- Scientific data, 302
- SeaWiFS CDOM, 193–195
- Self-organizing map (SOM), 196–197, 202–206
- Semi-supervised learning, 313
- Senegal flood vulnerability
 - Big Data information, 297
 - critical information gap, 294–295
 - global and local communities, 298
 - machine learning hydrology, 295
 - resilience, 296, 298, 299
 - socio-physical vulnerability, 295–297
- Sensor Observation Service (SOS), 115
- Sentinel-2 data service platform, 262, 265, 268, 279–280
- Sentinel-1 data services, 279–281
- Service integration, 63
- SETI@home project, 78
- Settlement Mapping Tool (SMTOOL), 144–145
 - CGMA ratio, 151
 - CPU-based commercial remote sensing packages, 148
 - CUDA, 150–151
 - GPU-based computational framework, 147–148
 - LandScan HD population distribution model, 146
 - LULC data, 145
 - peta-scale earth observation imagery, 145
 - sub-meter resolution imagery, 146
 - 4 Tesla GPU workstation, 148, 149
 - TEXTONS performance, 148, 149
 - urban and rural population data, 145
- Sharing economy
 - components, 255
 - technical, commercial and legal aspects, 255–256
- Short Message Services (SMSs), 238, 239
- Simple REST API, 272, 273
- SINTEF, 122
- SkylineGlobe, 221
- Small and medium sized enterprises (SMEs), 5
- SOAP interface, 304
- Software as a Service (PaaS), 7
- Software Development Kit (SDK), 227
- Soil-leaf-canopy (SLC) model, 267
- Solutions Bank, 34

Space Age, 70
 Spatially resolved spectral imaging, 208
 Spills of national significance (SONS), 210, 213
 Sputnik, 70
 Story Maps, 304
 Sub-meter resolution imagery, 146
 SuperMap GIS, 222
 Support vector machines (SVMs), 179
 Surface and meteorology and Solar Energy (SSE) project, 307–308
 Sustainable agriculture and smart farming
 goal, 267
 information challenge, 261–262
 multi-year site-characterization, 262–264
 ripening status, 265
 up-to-date crop status, 265–267
 water-food-energy nexus, 268
 “Sustainable Urban Land Use Planning”
 course, 38
 Sustaining innovations, 18
 Synthetic Aperture Radar (SAR) imaging, 81, 211

T

Talkingfields (TF) Base Map, 262–264
 Telecommunication Data Viewer
 EST-WA
 architecture, 234, 235
 CDM, 234
 EST-WA2D, 234–236
 EST-WA3D, 234–238
 netCDF Java library, 234
 SMSs, visualization of, 238–239
 spatio-temporal variable distributions,
 visualization of, 234
 netCDF, 233
 Temporal usage profiles, 252
 Thematic exploitation platforms, 265
 Time-dependent activity surfaces, 251
 Tomnod system, 77, 84
 Toolbox for Urban Mobility Simulations
 (TUMS)
 Big Data, 156
 features, 151
 LandScanUSA and LandScanGlobal
 datasets, 151–152
 link-based visualization tool, 153
 LPC resolution, 155
 microscopic traffic simulation modeling,
 151
 OD tables, 153–155
 OSM, 151, 152

pre-processing component, 152
 TAZ size, 154–155
 traffic simulation models, 152, 153
 TRANSIMS, 151, 153
 unified network and population database,
 155–156
 vehicle-based visualization tool, 153, 154
 Traffic Analysis Zone (TAZ), 154–155
 TRansportation ANalysis SIMulation System
 (TRANSIMS), 151, 153

U

Unmanned aerial vehicles (UAVs), 248
 Unsupervised classification, 196
 Urban Dynamics Institute (UDI), 144
 Urban Information System (UrbIS)
 Big Data, 157
 environment and climate, urban impact on,
 156–157
 federated metadata search interface,
 159–160, 162
 format conversion, 158
 goal, 157
 harvested data, maintenance of, 158
 HPC computations for analysis and
 modeling, 159, 161–163
 iGlobe, 159
 metadata search, 157–158
 RESTful programming interface, 162
 visualization interface, 161, 162
 workspace manager interface, 160, 162
 Urban planning, 124
 UrtheCast, 14
 User access portal, 62–63

V

Vegetation indices, 168–170
 Vehicle-based visualization tool, 153, 154
 Very high resolution (VHR) satellite imagery,
 247
 Virtual globes, 220
 ArcGIS Explorer, 221
 capabilities of, 223
 classifications of, 222
 collaborative mapping, 224
 as data fusion tools, 224
 DEMs, 221
 Digital Earth, 222–223
 examples, 221–222
 features, 221
 Geo-Wiki, 224
 Google Earth, 221, 223, 224

- Virtual globes (*cont.*)
 - limits of, 223
 - LULC data, 224
 - NASA World Wind, 114–115
 - PoliCrowd
 - functionalities, 228–232
 - NASA World Wind Java SDK, 226–227
 - ODK suite, 225–226
 - open source software, 225
 - system architecture, 227–228
 - scientific disciplines, use in, 223
 - urban planning projects, 224
 - user functions, 223
 - VGI, 220, 224
 - VIEW-IT, 224
 - VisioMIMEXT application, 224
 - WebGL-based virtual globes, 222
 - World Wind, 221, 222, 224
 - Virtual Interpretation of EarthWeb-Interface Tool (VIEW-IT), 224
 - Volunteer computing, 75, 78
 - Volunteered geo-dynamic information (VGDI), 249–251
 - Volunteered geographic information (VGI), 16, 73, 248, 249, 252
 - citizen science, 220
 - sources of, 220
 - and virtual globes, 224
 - Volunteer thinking, 75, 78
- W**
- Wadden Sea water-quality indicators
 - inductive learning
 - class classification problem, 316
 - data description, 314–315
 - decision trees, 313–314, 319
 - Earth observations, 315
 - FU scale model, 315–319
 - in situ monitoring platform, 312
 - study area, 314
 - Water-food-energy nexus, 268
 - Water holding capacity, 263
 - WB Academy, 36
 - WB Connect, 36–37
 - WB Talks, 36
 - Weather Underground network, 77, 79
 - Web Coverage Processing Service (WCPS), 93, 95, 97–98
 - Web Coverage Service (WCS), 93, 95–97, 304
 - Web GIS, 303
 - WebGL Earth, 222
 - WebGL Globe, 222
 - Web Mapping Services (WMSs), 99, 227
 - WebWorldWind, 162
 - WeSenseIt project, 81
 - Wildfires
 - change detection, 273
 - characteristics, 272
 - historical events, 272
 - risk map, 274
 - Windows Azure Marketplace DataMarket, 20
 - World Bank
 - Big Data innovation, 285–286
 - OLC (*see* Open Learning Campus (OLC))
 - World Bank Group (WBG)
 - flexible pathways to learning, 36–37
 - geospatial data, 37–38
 - geospatial data sharing and visualisation, 34
 - incorporating spatial data, 38–39
 - issues and messages, 39–40
 - learning as an accelerator to achieve development goals, 34–35
 - progress, 35–36
 - World Economic Forum, 276
 - World Wind, 221, 222
- X**
- XLSForm, 226
- Y**
- Yields, 261, 263, 264