Алматы қаласы
Цифрландыру
Басқармасы

Almaty
Data
Lake

Almaty Data Lake: cluster development

Economic cluster

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Almaty Data Lake

Explorable Economic Indicators – Household Net Worth

Indicator #1	**Household Net Worth**
Definition / Usage	• Value of total assets minus the total value of outstanding liabilities • When net wealth increases due to e.g. a rise in share prices, households feel richer and are more inclined to save less and spend more • As such, the net wealth of households plays an important role in economic analyses, such as studies of asset bubbles and analyses of welfare • Knowing the household net worth will help policymaker make better decision in terms of financial assistance and subsidy
Possible Dataset	• Almaty City's household assets and household liabilities over the years • Almaty City's 's household assets components over the years • Almaty City's household liabilities components over the years
Possible Data Representation(s)	• Chart showing the household asset, household liabilities as well as household net wealth over the years • Chart showing the percentage of residential property asset and financial assets over the years • Chart showing the percentage of personal loan and mortgage loan over the years

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Case Study #1

Almaty Data Lake

Here's how much money it takes to be considered 'financially comfortable' in 12 major U.S. cities

Somewhere between living paycheck-to-paycheck and owning a yacht, Americans are considered "financially comfortable" if they have a net worth of $774,000, a recent survey finds.
However, that amount changes depending on which city you live in. You'll need a net worth over $1 million to be considered financially comfortable by your peers in cities with a high cost of living like San Francisco or New York, according to financial services company Charles Schwab's annual Modern Wealth Survey.
In San Francisco, the threshold for what survey respondents consider financially comfortable is a net worth of $1.7 million. That's the highest total in the survey, which examined 12 of the biggest metropolitan areas in the U.S.

Here's a look at what it takes to be seen as financially comfortable by city in 2022, as ranked by net worth thresholds:

1. **San Francisco**: $1.7 million
2. **New York City**: $1.4 million
3. **Southern California** (includes Los Angeles and San Diego): $1.3 million
4. **Seattle**: $1.2 million
5. **Washington, D.C.**: $1.1 million
6. **Chicago**: $956,000
7. **Houston**: $919,000
8. **Boston**: $892,000
9. **Dallas**: $840,000
10. **Atlanta**: $771,000
11. **Phoenix**: $747,000
12. **Denver**: $671,000

In 2019, the median household net worth in the United States is $121,700. However, from this chart, it is evident that San Francisco has a higher net worth than other cities. In this way, knowing the net worth of each city will help the local government develop policies to help the residents of each city.

The online survey was conducted in early February, with a sample of 500 to 750 local residents for each metropolitan area, between the ages of 21 and 75. The term "financially comfortable" is a subjective term that will mean different things to different people. It could mean having a lot of disposable income, or it could mean simply owning a house while having enough money left over each month to save for retirement.

To help put things into perspective, the median net worth per household in 2019 was $121,700, according to the Federal Reserve's most recent data. Net worth is a measure of the value of the assets a person or corporation owns, minus the liabilities they owe.

Source: https://www.cnbc.com/2022/07/10/how-much-money-it-takes-to-be-financially-comfortable-in-us-cities.html

Other Explorable Economic Indicators – Prices

Indicator #1	**Consumer Price Index (CPI)**
Definition / Usage	• Overall change in consumer prices based on a representative basket of goods and services over time • Most widely used measure of inflation, closely followed by policymakers, financial markets, businesses, and consumers
Possible Dataset	• Almaty City's percentage change in CPI by household income group over the years
Possible Data Representation(s)	• Chart showing the percentage change in CPI by household income group, 25th percentile income group, 50th percentile income group and 75th percentile income group

Other Explorable Economic Indicators – Prices

Indicator #2	**Residential Property Price Indices (RPPIs), also called House Price Indices (HPIs)**
Definition / Usage	• Index numbers measuring the rate at which the prices of residential properties (flats, detached houses, terraced houses, etc.) purchased by households are changing over time • Both new and existing dwellings are covered if available, independently of their final use and their previous owners • Only market prices are considered. They include the price of the land on which residential buildings are located • Functions as an analytical tool for estimating changes in the rates of mortgage defaults, prepayments, and housing affordability
Possible Dataset	• Almaty City's percentage change in RPPI for each residential properties over the years
Possible Data Representation(s)	• Chart showing the percentage change in RPPI for each residential properties over the years

Case Study #2: CPI San-Francisco

Inflation means a Bay Area resident will spend $4,400 more for the same stuff this year

Bay Area price increase of goods by category

Category	Average annual costs in 2019-2020	Feb. '21 to Feb. '22 inflation rate	Price increase
Housing	$34,490	2.4%	$828
Food	$11,466	9.0%	$1,032
Transportation	$11,099	16.5%	$1,831
Healthcare	$5,687	2.3%	$131
Entertainment	$4,036	8.9%	$359
Apparel and services	$2,110	7.2%	$152
Education	$2,110	3.1%	$65
Alcoholic beverages	$1,009	1.3%	$13
Personal care products and services	$1,009	0.8%	$8

Source: U.S. Bureau of Labor Statistics

*This value was calculated using the U.S. CPI increase for this category.

Source: https://www.sfchronicle.com/bayarea/article/san-francisco-inflation-17073956.php

The biggest price increase came in the transportation category, rising 16.5% from February 2021 to 2022 for a total increase of about $1,830 a year. Within that category, the largest jump in dollars spent was for motor fuel, which increased 36% year-over-year. Prices for used cars and trucks rose 40% year-over-year.

Food prices increased 9% year-over-year, leading to an average annual increase in spending of more than $1,000. Meat, poultry, fish and eggs went up 11%; dairy rose 9%; and fruits and vegetables increased 7% in the past year, according to the Consumer Price Index for the San Francisco metro region.

Jamie Court, president of nonprofit Consumer Watchdog said this is "not sustainable" and lawmakers need to do more, "through tax credits for low wage workers or other means or people will simply be priced out of their lives."

"It's shocking when you hear the increase in terms of dollars, rather than percentage points," he said. "A $15-per-hour worker would have to work nearly two months to make up for inflation at that rate, and that's before taxes."

He fears that in California, more people will leave due to these rising costs, and advises redistributing the wealth in the state better and giving lower income residents incentives to stay.

Court said consumers will eventually start spending less, particularly on travel and high-end products.

"It will take some time, particularly as we have a pandemic hangover and savings that accumulated during the pandemic to use up," he said, and that people are itching to get out and about and risk overspending on credit cards as interest rates rise.

"It could be a perfect storm for those without much disposable savings," he added.

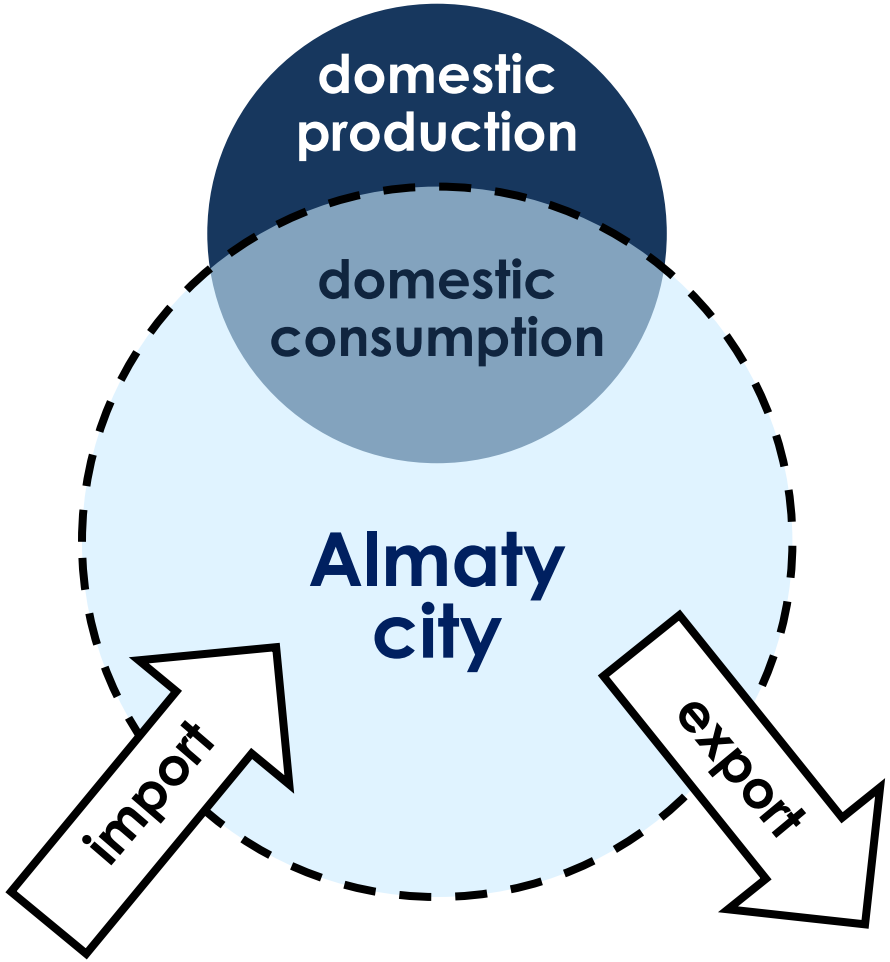
So what should consumers do? For one thing, don't spend on things you don't need, he said.

"People need to be conscious of the price of things, more so than ever," Court said. "Consumers need to comparison shop and hold off on discretionary purchases that don't make sense."

He said that workers have the upper hand right now as they are in high demand, and "should consider asking for raises to keep up with the price increases."

Logistics cluster

Trade balance of Almaty city



Main interest of the city in this case is the desire to draw up a generalized balance of trade within the city for main types of goods:

1. Food
2. Pharmaceuticals
3. Office equipment and more

City logistics

Components of urban logistics:

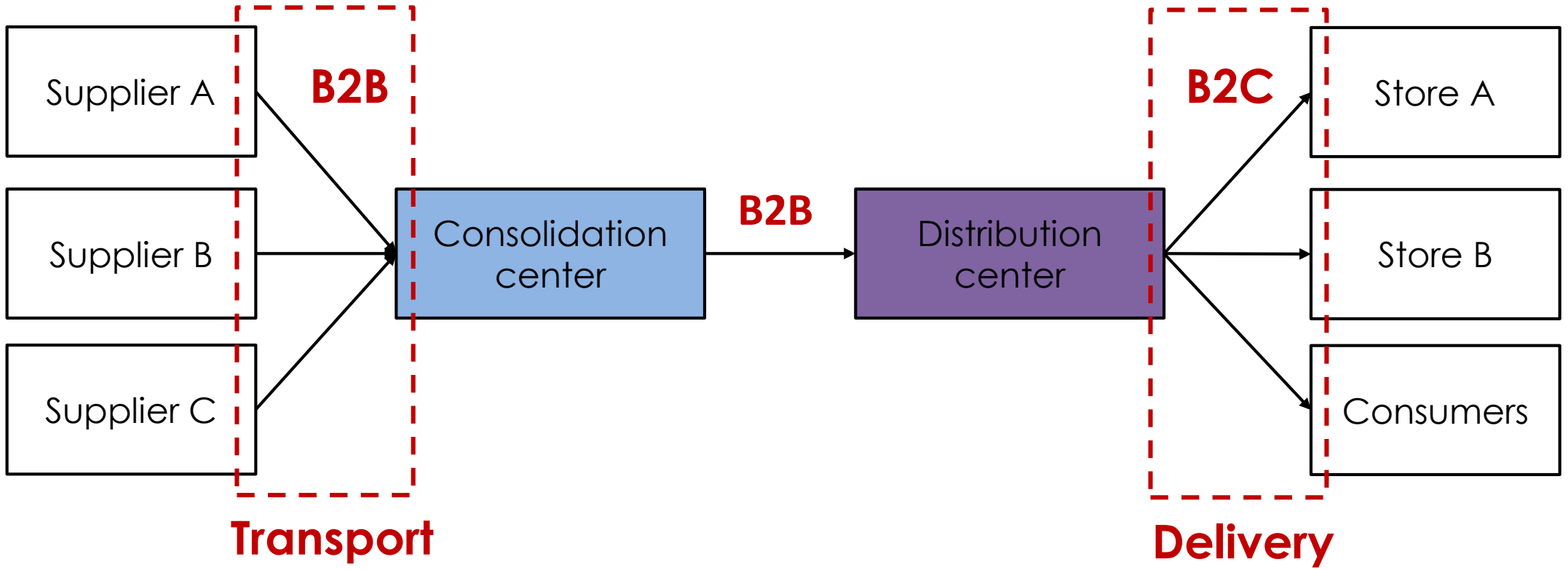
1. Freight transportation
2. Freight distribution
3. Goods handling
4. Goods storage
5. Waste management
6. Return management
7. Delivery

Reverse logistics

Major issues:

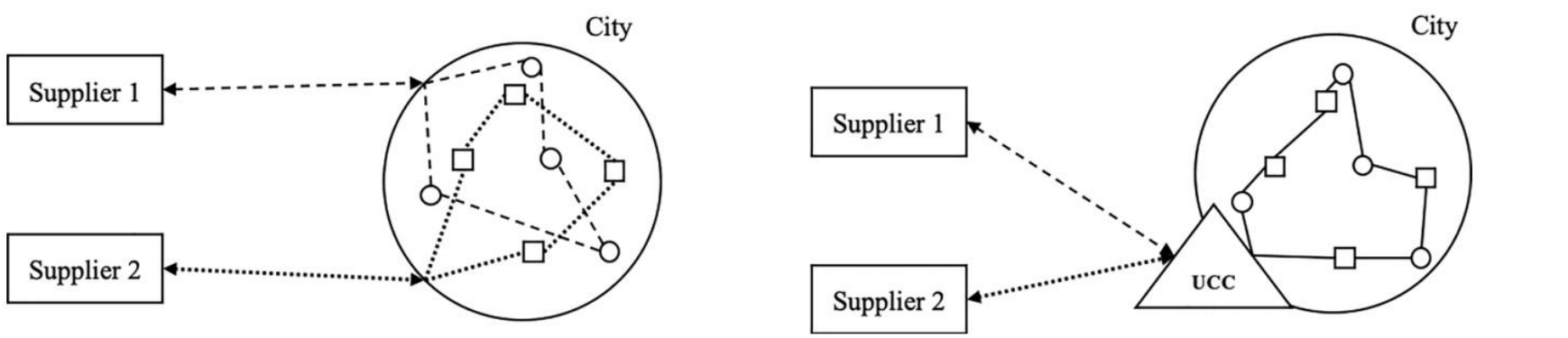
1. Last-mile delivery – heavy load on the city's transport system due to low efficiency and booming online commerce
2. Disconnect between various transportation/ delivery systems in the city
3. Low visibility/transparency –> low possibility of digitization and optimization

Optimal chain configuration



B2B – Business-to-Business, **B2C** – Business-to-Customer

Urban solutions: urban consolidation center



Urban consolidation center (UCC) – a logistics facility located in suburban or intra-district areas where goods from different suppliers can be consolidated.

Goal of UCC is **to reduce the overall distance traveled** when delivering goods to urban areas by **increasing the load factor of vehicles entering the city.**

Creation of new consolidation centers or transformation of existing facilities into such often requires government support, therefore, the city itself should be the initiator of this solution.

Urban solutions:
Integration and reorganization of freight transport and distribution networks

Currently, the systems of transportation and distribution of goods within the city belong to different enterprises and are mainly fragmented.

City can provide a platform where these systems can be gradually integrated in a horizontal/joint way where participants become equal partners.

The data that will be uploaded to the platform will be collected in an anonymized form and used for the needs of the city.

Digital supply chain

Main goal of supply chain digitalization is to increase transparency of the entire system and its visibility for all important participants.

Digital solutions for supply chain optimization using technologies of Industry 4.0:

1. Digital twin
2. Big data and data analytics
3. Blockchain (improving cooperation and transparency of supply chain between stakeholders)
4. Internet-of-Things (IoT): sensors, radio frequency identification devices (RFID) и GPS-tracking (tracking goods in real time and fast response)
5. Additive manufacturing (3D printing)
6. Artificial intelligence and machine learning (chain simplification, resource planning, demand forecasting)
7. Cloud computing

Land management cluster
(Standardizing GIS for Almaty agglomeration)

Standards publishers

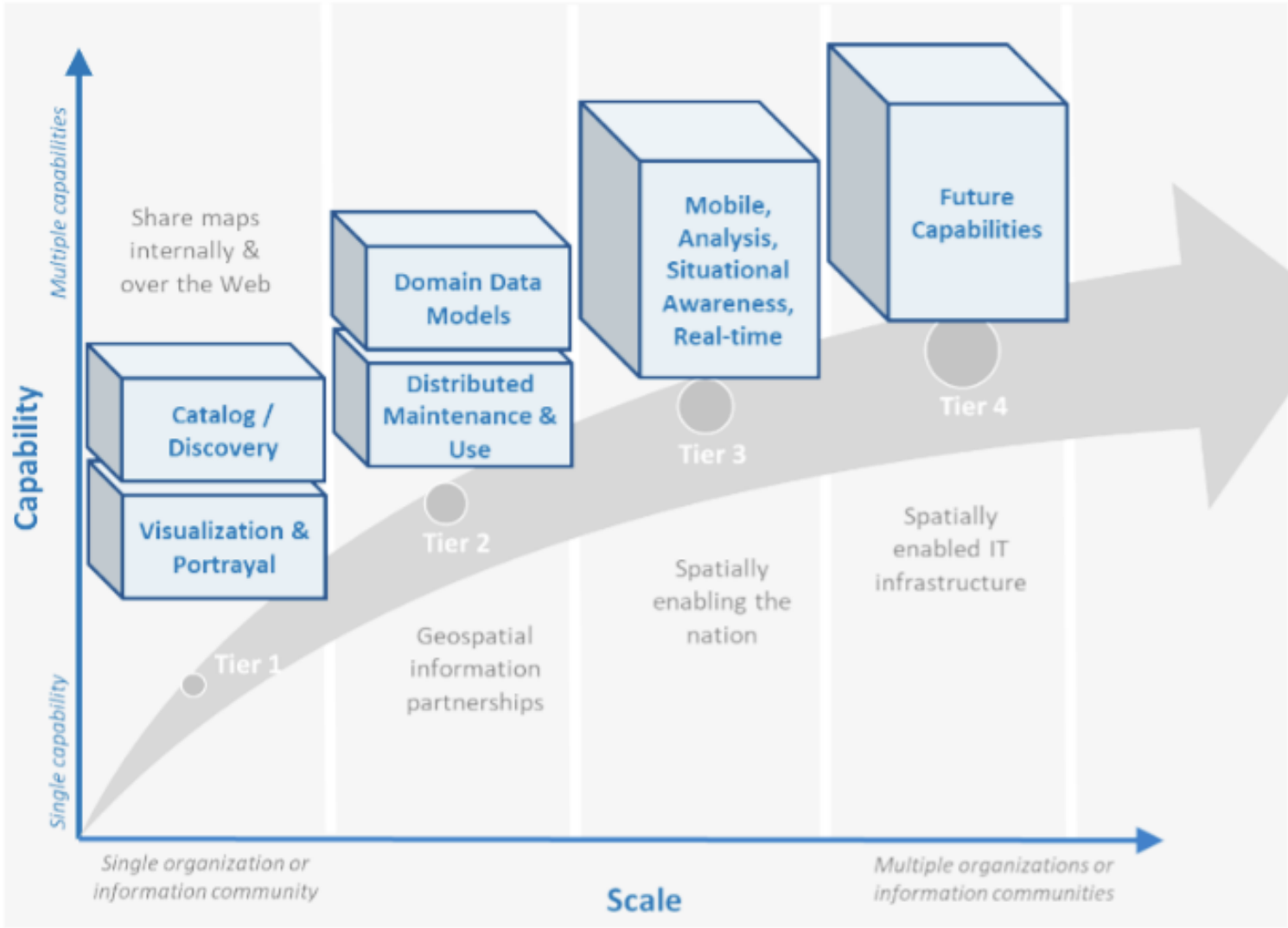
1. International:
   a. **Committee ISO/TC 211 «Geographic information/Geomatics» - major** (it is recommended not to create a new standard, if a similar one was published by the Committee)
   b. Open Geospatial Consortium (OGC) – created the initial standards for GML and WMS, which laid the foundation of many TC 211 standards, and continues on standardizing processes supporting technical
   c. European Committee for Standardization (CEN) TC 287 – creates European profiles of ISO standards, also works on *Infrastructure for Spatial Information in the European Community (INSPIRE)*
2. National:
   a. Canadian Geospatial Data Infrastructure (CGDI) – GeoConnections **(Tier 3)**
   b. USA, Federal Geographic Data Committee (FGDC) – National Spatial Data Infrastructure (NSDI), made a major contribution to metadata standard, which was accepted by TC 211
   c. Norwegian Spatial Data Infrastructure - Norway Digital **(Tier 3)**
3. Regional/city:
   a. Dallas, USA **(between Tier 1 and 2)**

Tiers of development

Why spatial data and GIS standards are important?

- Interoperability between different sources and types of spatial data
- Compatibility and consistency of data with varying creation and use contexts

Now we are in Tier 1, where different maps are published, but no active data sharing occurs between stakeholders.



OGC, ISO/TC 211, IHO 2018

Tier 1: share maps over the Internet

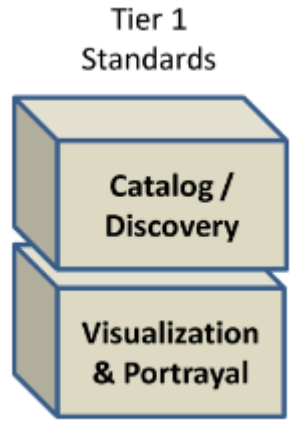
Purpose: To enable stakeholders and constituents (users) of an organization or institution to view and request interactive maps on the Internet.

Capability: Discovery, exchange and use of geospatial information.

Visualization and display: Spatial Data Infrastructure (SDI) should provide easy and efficient access and display of spatial data stored in one or more databases using solutions and storage formats of various publishers.

Catalog and discovery: the ability to search for spatial information in metadata stores is required. Metadata and catalog search also allow the user to determine if spatial information is suitable for a particular purpose.

Data content and management: description, organization, collection and management of spatial data. The standards will help improve the ability to collect, manage and update data.



OGC, ISO/TC 211, IHO 2018

Tier 1: recommended ISO and OGC standards

Visualization and portrayal

- OGC Web Map Service/ISO1 19128 Web Map Server Interface (WMS), OGC Web Map Tile Service (WMTS) for quick rendering
- OGC Styled Layer Descriptor (SLD)
- OGC Symbology Encoding
- OGC Web Map Context (WMC), OGC Web Services Context Document (OWS Context)
- OGC KML, ISO 19136 – GML, ISO 19139 – XML

Catalog and search

- ISO 19109 - Rules for application schema
- ISO 19110 - Methodology for feature cataloguing
- ISO 19115 – Metadata
- Catalogues: OGC Catalogue Service 19115 Metadata application profile, OGC Catalogue Services Specification 2.0.2 - ISO Metadata Application Profile (1.0.0), OGC I15 (ISO 19115 Metadata) Extension Package of CS-WebRIM2 Profile 1.0
- ISO 19126 – Feature concept dictionaries & registers, ISO 19135 - Registers
- OGC Geopackage - Format for transferring Geospatial Information

OGC, ISO/TC 211, IHO 2018

Tier 1: recommended steps

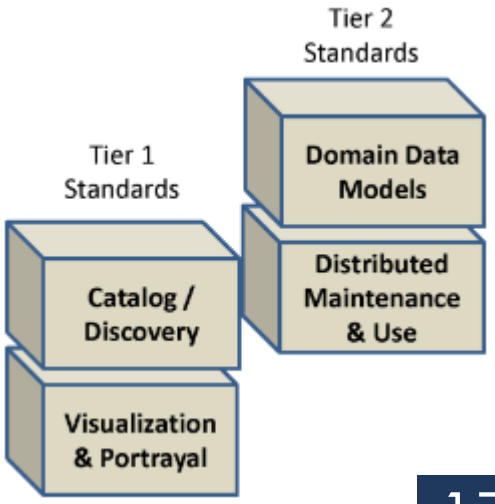
1. Build the **correct data management logic** using ISO/TC 211 Foundational standards
2. **Define data themes** to be exchanged and prepare sharing and access agreements, map symbol rules, authentication/authorization rules
3. OGC/ISO Web Map Service for displaying geodata from various sources online
4. Develop a registry of geospatial information -> for discovery, viewing and publishing - **need to implement the collection and support of metadata**
5. Semantics and reference books with definitions of geographical objects in 3 languages (**feature concept dictionaries**)
6. **Choose multiple data distribution formats** and how users can request information

Tier 2: partnerships

Purpose: To provide specific groups of data, such as roads, from multiple sources that conform to a consistent common data model to create a consistent, integrated "view" of information for users. Tier 2 builds on the infrastructure, policies, technologies, and standards deployed and enhanced in Tier 1.

Distributed maintenance and use: representation of concepts and relationships, constraints, rules and operations to define the semantics of data **within one selected domain** (transport, land use, etc.). The goal is to allow multiple stakeholders to come to an agreement on how to present data for a particular area to improve interoperability and data sharing.

Domain data modelling: includes the practice of creating definitions of concepts, semantics, and data organization (schema) **used simultaneously in several domains.**



OGC, ISO/TC 211, IHO 2018

Tier 2: recommended ISO and OGC standards

Distributed maintenance and use

- OGC/ISO 19136 Geography Markup Language (GML) (моделирование и обмен)
- OGC/ISO 19142 Web Feature Service 2.0 (requests)
- OGC/ISO 19143 Filter Encoding 2.0 (queries)
- OGC Web Coverage Service (WCS) 2.0 (coverage data)

Domain data modelling

- ISO 19109, Geographic information – Rules for application schemas
- OGC OWS-8 Domain Modelling Cookbook
- ISO 19144, Geographic information -- Classification systems
- ISO 19152, Geographic information -- Land Administration Domain Model (LADM)
- ISO 19160, Addressing
- S-57 - IHO Transfer Standard for Digital Hydrographic Data

OGC, ISO/TC 211, IHO 2018

Tier 2: recommendations

1. Good comprehension and use of **abstract standards - ISO/TC 211 Foundational standards**
2. Establishing a unified (1) conceptual (scheme, data model) and (2) semantic (dictionary) basis for working with data for building domains in collaboration with stakeholders
3. Building domain data models used in separate systems based on **ISO 19109 and OGC OWS-8**

OGC, ISO/TC 211, IHO 2018

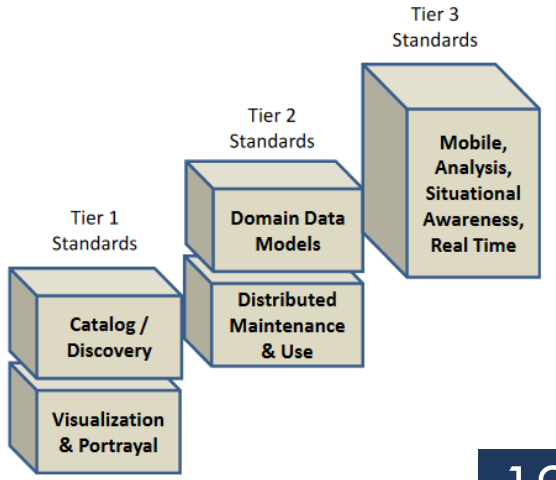
Tier 3: spatially enabling the nation - services

Goal: Sharing fundamental/ framework geospatial information and services with each other and the public to improve knowledge and understanding, facilitating data-driven decision making, situational awareness, and solving socio-economic challenges.

Geospatial processing and analytics: OGC Web Processing Service (WPS).
Grid systems: OGC Discrete Global Grid Systems (DGGS).

Mobile devices: OGC web services standards, OGC Open GeoSMS, OGC GeoPackage.

Real-time: IoT - sensors. OGC/ISO Observations & Measurements Schema (O&M) / ISO 19156, OGC Observations and Measurements XML (OMXML), OGC Sensor Model Language (SensorML), OGC Sensor Observations Service (SOS), OGC Sensor Planning Service (SPS), OGC SensorThings API .



OGC, ISO/TC 211, IHO 2018

Examples of domains

ANZLIC Australian and New Zealand Foundation Spatial Data Framework

Data product specifications

The idea is to treat each layer as a separate product with its own specification, which can act as a standard for this layer.

The city's main data products are:

1. Administrative boundaries
2. Water bodies
3. Geographic names
4. Transport system
5. Land
6. Coordinate systems and grids
7. Buildings and structures

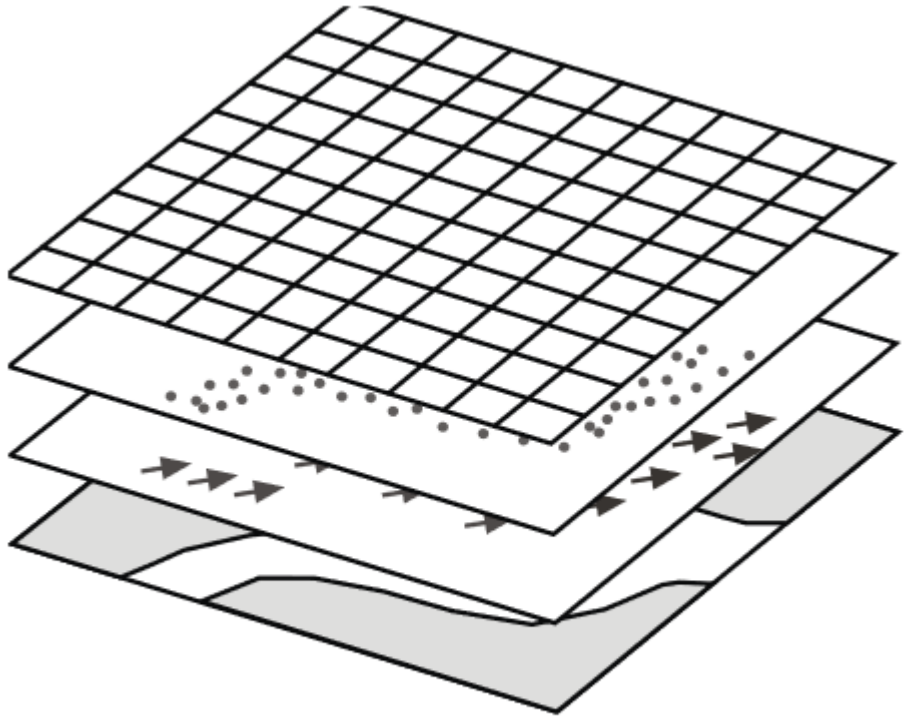


Figure 7. Example of a set of layers.

INSPIRE Data specifications for Annex I

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Thank you for your attention!