Joint GEOProcessing and ICDS 2015 International Expert Panel:

Geo Measurements and Urban Challenges

February 25, 2015, Lisbon, Portugal

The Seventh International Conference on Advanced Geographic Information Systems, Applications, and Services
and
The Ninth International Conference on Digital Society
(GEOProcessing and ICDS / DigitalWorld 2015)

GEOProcessing and ICDS / DigitalWorld
February 22–27, 2015 - Lisbon, Portugal

GEOProcessing & ICDS Panel: Geo Measurements and Urban Challenges

Panelists

- *Claus-Peter Rückemann* (Moderator),
  Westfälische Wilhelms-Universität Münster (WWU) / Leibniz Universität Hannover / North-German Supercomputing Alliance (HLRN), Germany
- *Yerach Doytsher,*
  Technion - Israel Institute of Technology, Haifa, Israel
- *Kazuaki Iwamura,*
  Hitachi, Ltd., Japan
- *Lasse Berntzen,*
  HBV, Norway
- *Claus-Peter Rückemann,*
  WWU Münster / Leibniz Universität Hannover / HLRN, Germany

GEOProcessing 2015 and ICDS 2015:
`http://www.iaria.org/conferences2015/GEOProcessing15.html`
`http://www.iaria.org/conferences2015/ICDS15.html`

GEOProcessing & ICDS Panel: Geo Measurements and Urban Challenges

Pre-Discussion-Wrapup:

- **Scenarios:** Can Geo-measurements help with solutions for urban challenges, how, and where?
- **Disciplines:** Natural sciences, information technology, geoinformatics, engineering, ...?
- **Data and sources:** Will crowdsourced geospatial data affect the planning and management of cities?
- **How:** "Howto" smart cities / social infrastructures?
- **Methods:** What are effective geospatial processing methods for the purposes in focus?
- **Geotagging:** Examples for geotagged data?
- **Visualisation:** What about geovisualisation?
- **Planning:** Examples for a digital planning dialog?
- **Sustainability:** Multi-disciplinary and long-term perspectives?
- **Networking:** Discussion! Open Questions? Suggestions for next Expert Panel?

GEOProcessing & ICDS Panel: Post-Panel-Discussion Summary

Post-Panel-Discussion Summary (2015-02-25):

- There is the threat of **no privacy anymore** (beyond scenarios of "non-network" use)!
- **Components**: Integration of solutions, data organisation, geospatial data, GIS, analytics, fusion, near real-time data as well as long-term vital knowledge and transfer, various data sources, crowdsourced and coordinated approaches, geotagged data, geovisualisation and planning dialogs.
- **Most pressing**, nationally and internationally: **Privacy and data!**
- Required: **Legal framework(s)!**
- **Unanimous understanding** from Expert Panel: **Regulations required** for individual and integrated use of data.
- **International differences (legal and social) but global scenarios!**
- **Big Data** feasible via individually **"destilled"/"reduced"** information, which enables to be stored due much smaller volumes.
- **Practicable: Responsibilities where data is (actually) created and handled.**
- Data sources range from **crowdsourced, automated** (voluntary/without explicit consent) to **centralised/coordinated**.
- **Follow-up topic** suggestions for next international expert panels: **Metadata and legal regulations, international view**.

GEOProcessing & ICDS Panel: Table of Presentations, Attached

Panelist Presentations: (presentation order, following pages)

- **Natural Sciences and Practical Applications: Coping With Interests in Space-Time** (*Rückemann*)
- **The New Era of Crowdsourced Geospatial Data: Will it Affect the Planning and Management of Cities?** (*Doytsher*)
- **What are effective geospatial processing methods to realize smart cities or smart social infrastructures?** (*Iwamura*)
- **Geo Measurements and Urban Challenges (Geotagged data, Geovisualization, Digital Planning Dialog)** (*Berntzen*)

Joint GEOProcessing and ICDS International Expert Panel:
Geo Measurements and Urban Challenges

Natural Sciences and Practical Applications: Coping With Interests in Space-Time

The Seventh International Conference on
Advanced Geographic Information Systems, Applications, and Services (GEOProcessing 2015)
and The Ninth International Conference on Digital Society (ICDS 2015)
– DigitalWorld 2015 –
February 25, 2015, Lisbon, Portugal

Dr. rer. nat. Claus-Peter Rückemann[1,2,3]

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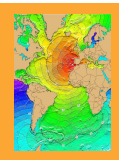
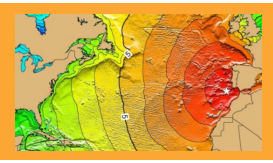




Status: Natural Sciences Measurements and Application

Space-and-time: Universal long-term knowledge and vitality?

Natural Sciences – Fundamental research – Long-term integration?
Applied Sciences – Practical applications – Long-term integration?

Scientific methods and data ...

- Geo-electric measurements
- Geo-magnetic measurements
- Gravimetric measurements
- Resistivity measurements
- Seismic measurements
- Geo-Radar, EMR, Tomography
- Borehole techniques
- RADAR, LIDAR, ...
- nD time-lapse 3D, 3.5D, 4D
- ...

Widely applied methods and data ...

- Scientific measurements
- Technical measurements
- Satellites / measurements
- Distance measurements
- Spatial Information
- Positioning data
- Various RT data
- ...

Status: Natural Sciences Measurements and Application

Meaning: Common and knowing – urban and beyond

- Common view ("urbs" :: larger city + walls, capital, urbs Roma).
- Comparative view (acropolis, arx, upper town, Athens).
- Abstracted view (urbs philosophiae, main thing, core).
- Transfered view (urbanitas, city life, life in Rome).
- Knowing/hidden view (Tacitus' position).

Challenges ...

- Context:
  - Natural, man-made, technical
- Time-frame:
  - Long-term, mid-term, short-term
- Isolated measurements
- Missing long-term perspectives
  - Data structures, data handling, infrastructures, application development, learning
- ...

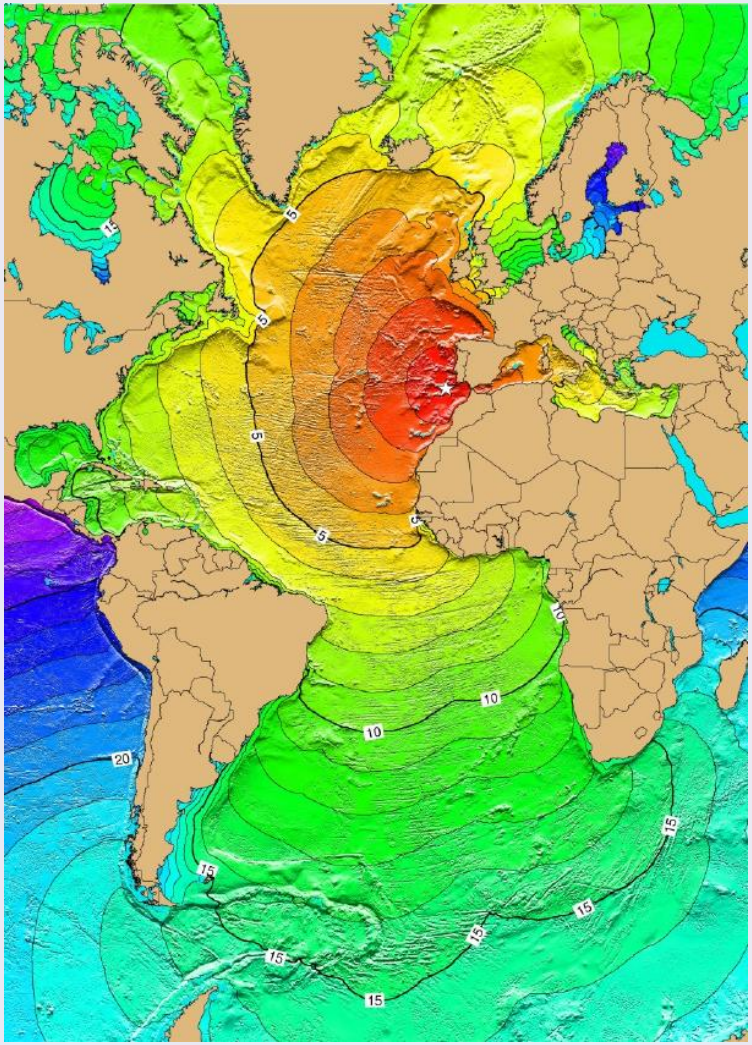
Space-Time

Desasters and Challenges

Time	Type - Chain	Sample Location
?	...	
?	Meteorites - Tsunami - Ash - Fires	[any]
?	Yellowstone Volcano - Eruption - Ash	Northern America
?	Hang Slide - Tsunami	Teneriffa
?	Earthquakes - Floods	Tokyo
	...	
!	Sea-level-rise	Seychelles
!	Land sink	Venice
!	Earthquakes - Instabilities	Mexico City
	...	
1755	Earthquake - Tsunami - Fires	Lisbon
79	Vesuvius - Eruption - Lahar - Fires	Napoli
62	Vesuvius - Eruption	Napoli
-1680	Thera Event - Tsunamis	Greece
-65000000	Chicxulub Event - Tsunamis	Yucatán

Measurements, Natural Sciences, and Infrastructures

Example: The Lisbon Earthquake



Calculated Tsunami Travel Times (TTT)

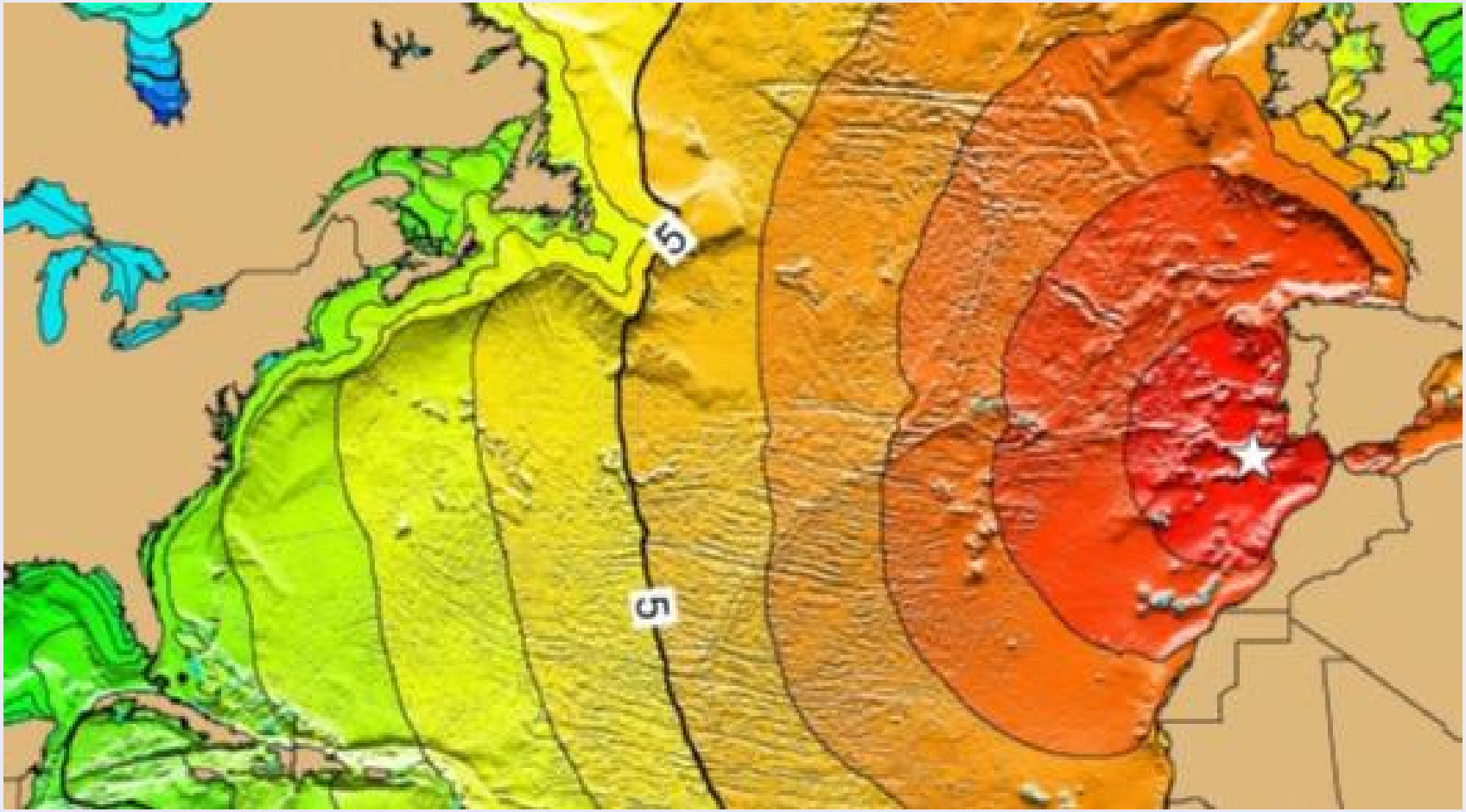
Lisbon Earthquake, 1755-11-01

Colour	TTT
Red:	1-4 hrs. arrival times
Yellow:	5-6 hrs. arrival times
Green:	7-14 hrs. arrival times
Blue:	15-21 hrs. arrival times

Source, data:
National Geophysical Data Center (NGDC), National Oceanographic and Atmospheric Administration (NOAA), USA;
License: Public Domain

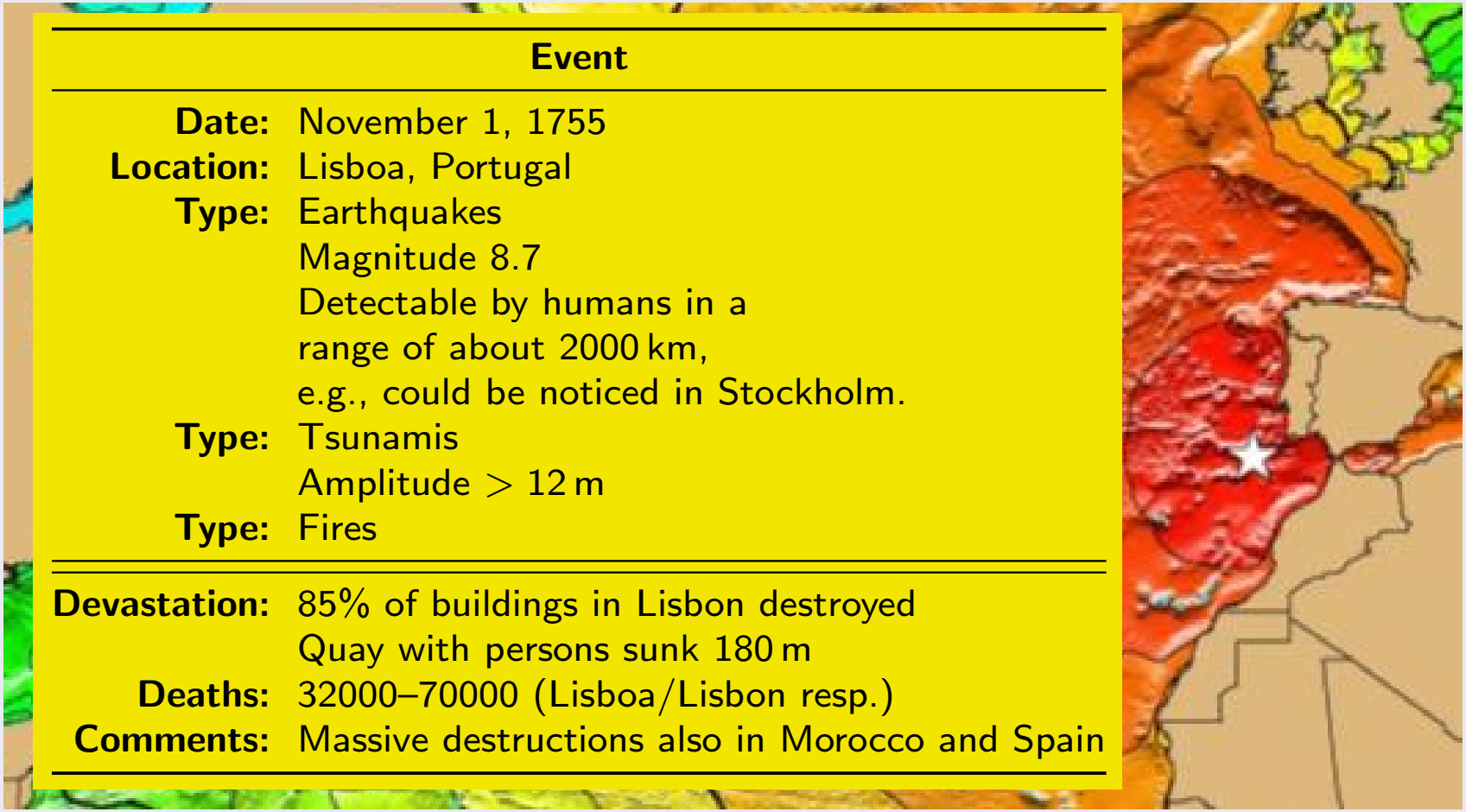
Measurements, Natural Sciences, and Infrastructures

Example: The Lisbon Earthquake – Zoom



Measurements, Natural Sciences, and Infrastructures

Example: The Lisbon Earthquake – Zoom



Event	
Date:	November 1, 1755
Location:	Lisboa, Portugal
Type:	Earthquakes
	Magnitude 8.7
	Detectable by humans in a range of about 2000 km, e.g., could be noticed in Stockholm.
Type:	Tsunamis
	Amplitude > 12 m
Type:	Fires
Devastation:	85% of buildings in Lisbon destroyed
	Quay with persons sunk 180 m
Deaths:	32000–70000 (Lisboa/Lisbon resp.)
Comments:	Massive destructions also in Morocco and Spain

Components

Measurements and purposes

- Documentation
- Conservation
- Construction
- Reconstruction
- Simulation
- Warning systems
- Plans (Preservation, Evacuation, ...)
- Safety and policies (access, qualities, ...)
- Long-term perspectives
- Protection (history, archaeology)
- Development (cities' infrastructures)
- ...

Measurements and means

- Knowledge resources (creation, documentation, ...)
- Computing
- Storage
- Integration
- ...

Vision – Integrated Trans-disciplinary View

Solutions!

- Integrate solutions (scientific measurements, city management, warning, evacuation, logistics, ...)
- Improve data organisation (structure, standards ...) and integration and create long-term knowledge resources!
- Create long-term means from High End Computing, simulation, modelling, intelligent systems, education!
- Foster multi- and trans-disciplinary solutions!
- Data/knowledge/content/context vitality and transfer!
- Deployment of systematics and methodologies with content,
- Long-term sustainability of universal knowledge discovery, multi-disciplinary, multi-lingual content.

Conclusions

Integration & development of long-term knowledge & measurements

- **Solutions, which can be integrated.**
- **Long-term data, structures, and means.**
- **Knowledge documentation, content / context.**
- **Multi- and trans-disciplinary work.**
- **Integrated Information and Computing System components.**
- **Mandatory best practice (e.g., for participation and funding).**

The New Era of Crowdsourced Geospatial Data:

Will it Affect the Planning and Management of Cities?

Prof. Dr. Yerach Doytsher

Mapping and Geo-Information Engineering,
Technion, Israel

GeoSpatial Data Acquisition

- **Traditionally:**
  - **Carried out by Professionals (“experts' domain”) – surveyors, cartographers, photogrammetrists, etc.**
  - **Mapping and surveying projects initiated by the public sector – NMAs, governmental agencies, municipalities, etc.**
- **Date acquired from different sources and of various qualities:**
  - **Field Surveying utilizing TS and GPS receivers**
  - **Photogrammetry utilizing stereo pairs of aerial/space imagery**
  - **Cartographic digitization and scanning of existing maps and drawings (e.g. urban infrastructure plans)**
  - **LiDAR systems utilizing laser ranging/GPS/INS techniques**

The Neogeography Revolution

- The GeoWeb has transformed itself as the platform for the novel and pioneering online GIS
- The mapping field becomes a public domain (not only an experts' domain)
- Users all over the world are nowadays involved in data collection and processing
- Mapping projects and services are using today groups of volunteers focusing on the of geographic data
- Creating and Updating geospatial information (online maps/applications) is becoming possible even by laymen
  - Practically replacing licensed surveyors/cartographers/geographer experts

⇒ **Crowdsourcing: A knowledge paradigm**

Urban Sensing Technology

- New citizen-activated sensors in the urban environment
  - Smartphones
  - Radio Frequency Identification (RFID) tagged items
  - Urban observation sensors (cameras & video recording)
- Active and/or passive collecting and managing a wide range of urban information
- Possibility to track movements of all citizens across a city
  - RFID like barcodes broadcasting their information
  - Everywhere surveillance through the use of mobile phones
  - Toll passes for vehicle tracking
  - Travel passes for individuals

Planning and Management of Cities

- **Efficient planning is based on updated geospatial data**
  - In the past in light of limitations (manpower and budget) - updating processes were not carried out on frequent basis
- **Efficient management should be based on (near) real-time info as to the human activity in the urban environment**
  - In the past this information was collected with a considerable delay – days, weeks or even months
- **The new era of VGI and crowdsourcing opens new frontiers toward collecting real time geospatial data - infrastructure info, pedestrians activity, traffic and many more**

Detailed and updated geospatial data will lead to efficient planning processes and effective management processes of cities ⇒ "smart cities"

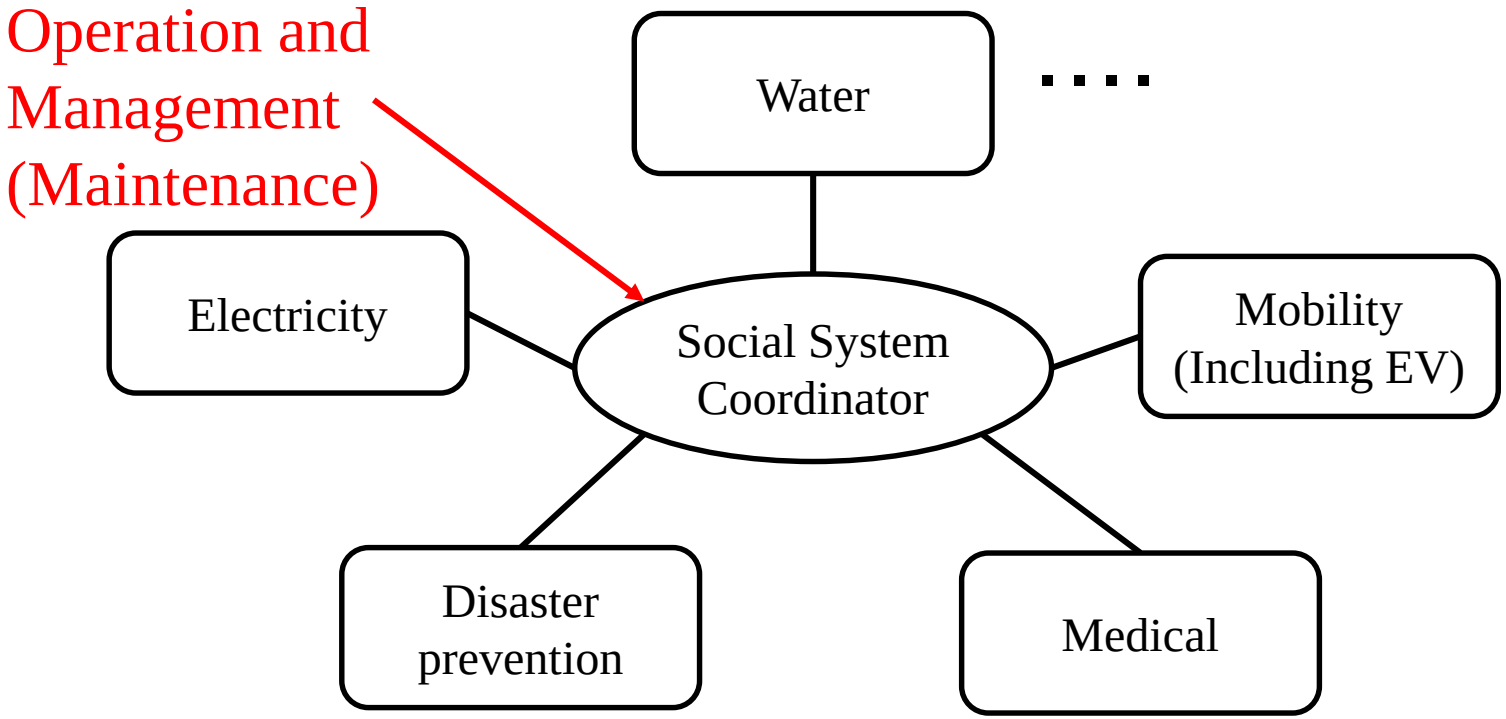
What are effective geospatial processing methods to realize smart cities or smart social infrastructures?

Hitachi, Ltd.

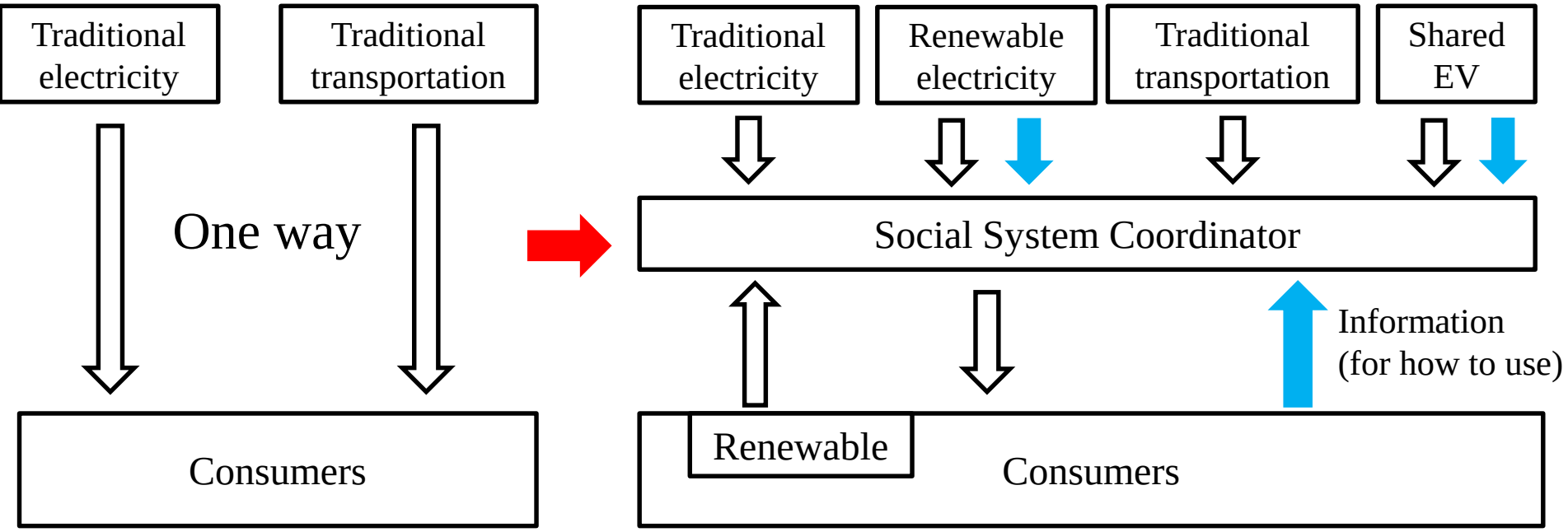
Kazuaki Iwamura

What is smart ?
Social System Coordinator

- What is smart (from the view of technology)?
  - ✓ Maintaining balance between supply and consumption
  - ✓ Total life cycle management of resources
- Roles of "Social System Coordinator" are important.



Social System Coordinator in future

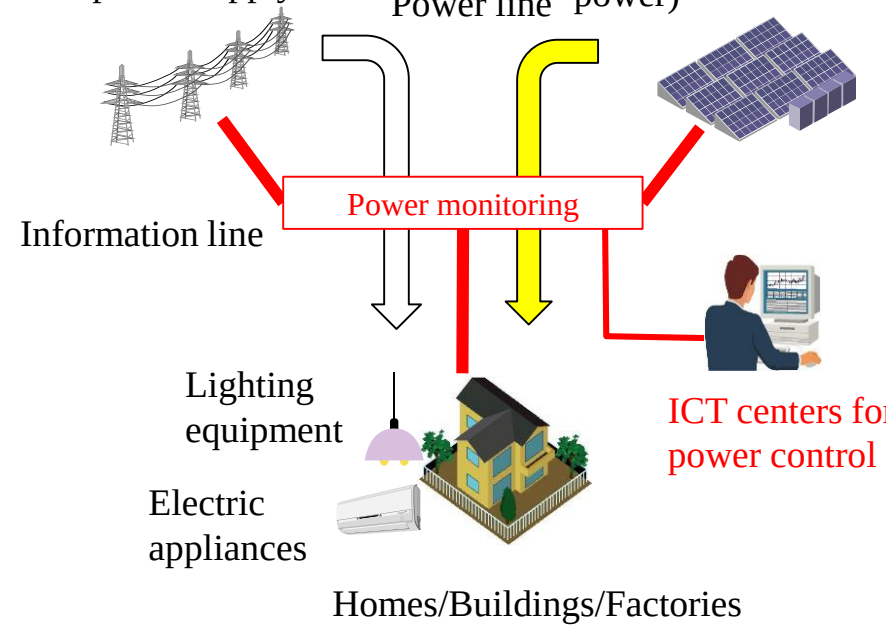


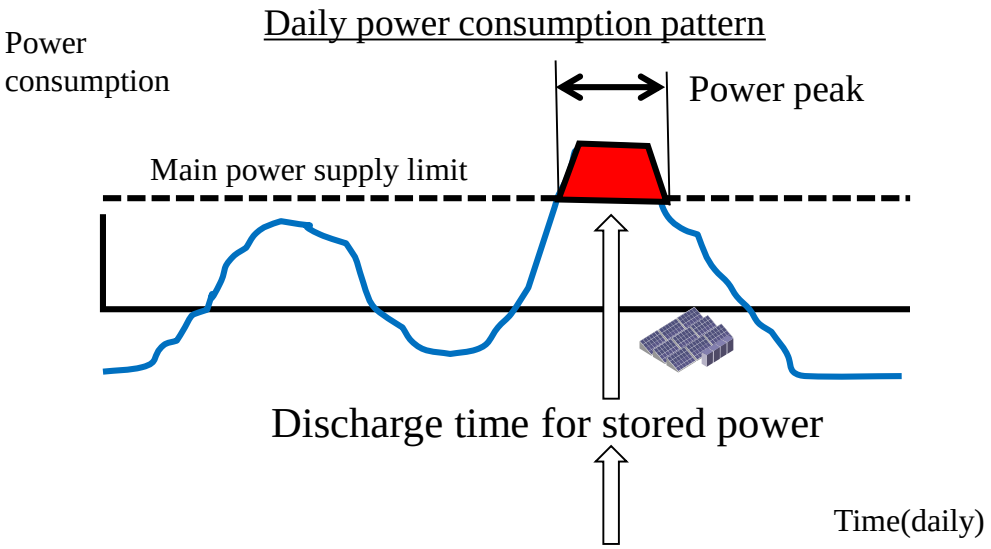
Essential Functions

- ✓ GIS in smart cities/communities
  - 2D, 3D or 4D(Spatio-temporal) ?
  - （Semi-)Real-time streaming data processing – Big data –
- ✓ Analytics
  - Geo-spatial statistics, Interpolation
  - Prediction
  - Knowledge aquitision
- ✓ Technology fusion
  - GIS + Technologies or sciences of other fields
    (Mechanical engineering, Power transmission, Statistics, etc.)

Smart Grid

- Economic development stimulates personal consumption. Thus, electricity consumption also increases.
- If ability of power supply facilities is not enough, auxiliary power units are necessary. ICT systems control effective power supply.





Common analytics functions in information & control platform

- Prediction of power peak using history data
- Knowledge acquisition for effectiveness of renewable energy release

Geo Measurements and Urban Challenges

Panel GEO/ICDS
Wednesday, February 25th, 2015
Lisbon, Portugal

Lasse Berntzen
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Geotagged data

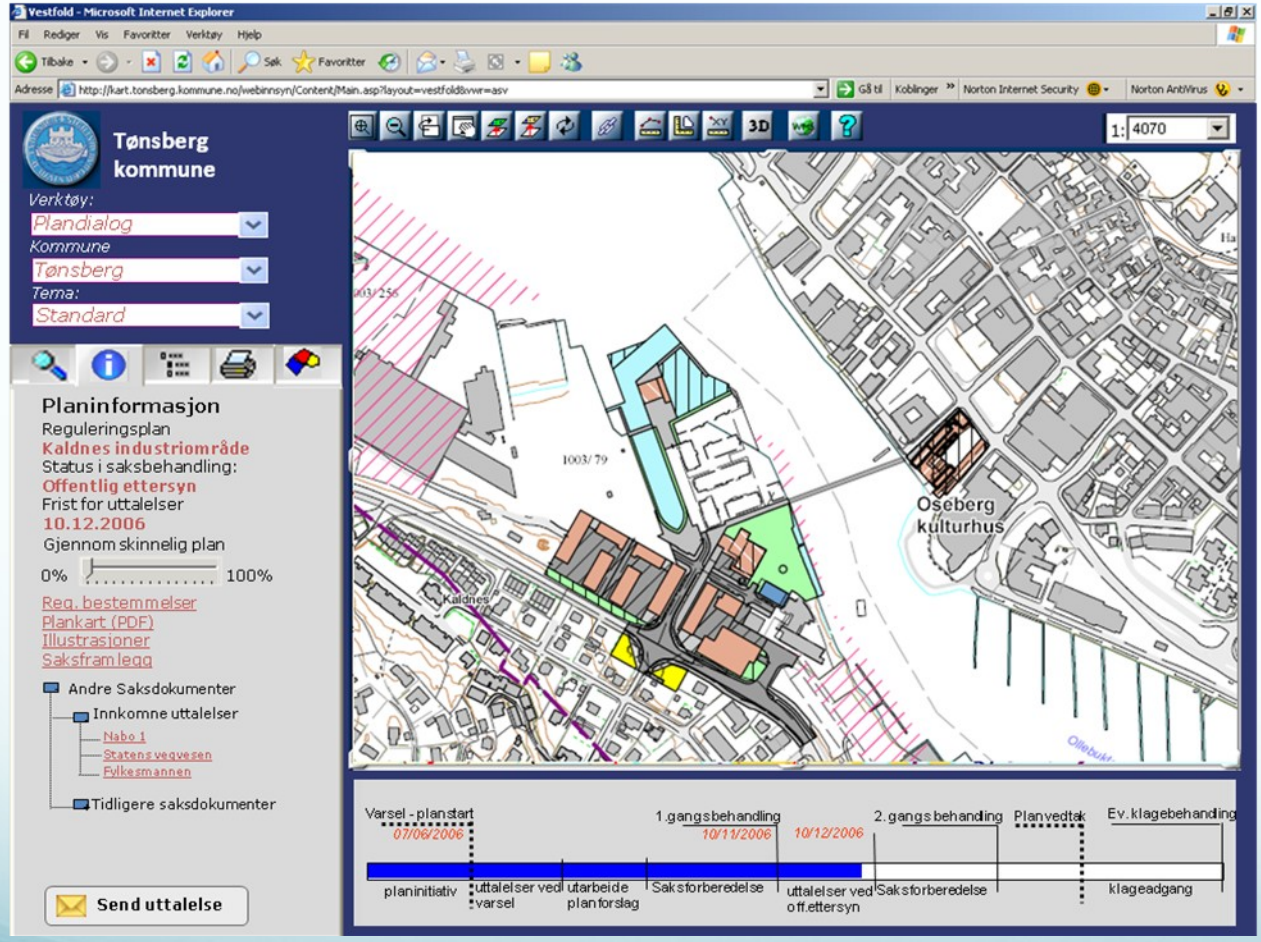
- Oversight and prediction.
- Real-time data is about reality, not theory.
- New devices with embedded sensors brings new opportunities for data collection.
  - Fixed location devices
  - Mobile location devices

Geovisualization

- Presenting problems and solutions through spatial visualizations brings new opportunities for understanding of, and deliberation on alternatives.

SimSam, a 360 degree visual simulator @ HBV

Digital Planning Dialog



To make spatial planning more efficient, transparent and democratic.

In production, showcase in government ICT plan.