SDG and International Society for Photogrammetry and Remote Sensing (ISPRS)

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Space-based systems for resilient and low-emission societies: The way forward
Working Group 3 on "International groups, platforms and partnerships
Nov 23, 2017
Agenda 2030 – 17 Sustainable development Goals

17 Sustainable Development Goals (SDGs) were adopted by world leaders in September 2015 at historic UN Summit.

On 1 January 2016, the 17 Sustainable Development Goals (SDGs) of the 2030 Agenda for Sustainable Development — officially came into force.
• Goal 1. End poverty in all its forms everywhere

• Goal 2. End hunger, achieve food security and improved nutrition and promote sustainable agriculture – DRR – drought

• Goal 3. Ensure healthy lives and promote well being for all at all ages – DRR -air pollution

• Goal 4. Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all

• Goal 5. Achieve gender equality and empower all women and girls

• Goal 6. Ensure availability and sustainable management of water and sanitation for all
• Goal 7. Ensure access to affordable, reliable, sustainable and modern energy for all

• Goal 8. Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all

• Goal 9. Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation

• Goal 10. Reduce inequality within and among countries

• Goal 11. Make cities and human settlements inclusive, safe, resilient and sustainable - DRR - flood, landslide, earthquake, ...

• Goal 12. Ensure sustainable consumption and production patterns
• Goal 13. Take urgent action to combat climate change and its impacts

• Goal 14. Conserve and sustainably use the oceans, seas and marine resources for sustainable development

• Goal 15. Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss – *not classified as disasters*

• Goal 16. Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels

• Goal 17. Strengthen the means of implementation and revitalize the Global Partnership for Sustainable Development
Goal 2. End hunger, achieve food security and improved nutrition and promote sustainable agriculture

WG III/10: Agriculture and Natural Ecosystems Modelling and Monitoring

Some of ToR:

• Development of new methodologies and algorithms for improving the contribution of remote sensing towards knowledges related to agriculture and natural ecosystems

• Test and assess new remote sensing algorithms for monitoring natural and anthropogenic ecosystems

• Apply remote sensing for supporting precision agriculture by spectral signature in crops for smart farm management

• Support climate change studies through remote sensing applications for global and regional scales dynamics monitoring and modelling
Goal 3. Ensure healthy lives and promote well being for all at all age

ICWG III/IVc: Environment and Health

Some of ToR:

Bridge the geospatial science, Earth science and health science communities to explore interdisciplinary collaborations to improve our overall health and well-being.

Develop two expert groups: 1) Remote Sensing and geospatial technology applications in estimating environmental exposure risk factor for clinical practices and 2) Remote Sensing and geospatial technology applications in ecosystem, climate change and variability, and public health studies.
WG III/8: Remote Sensing of Atmospheric Environment

Some of ToR:

- Development of satellite observations on atmospheric environment including air pollutants, aerosol and its dynamic process
- Development of new models for estimating atmospheric aerosol optical depth, characteristics and particulate matters (PMs) concentration
- Development of new models for extracting atmospheric parameters through sounders/GPS/LiDAR/radio occultation, etc.
- Development of spatio-temporal methodologies and GIS-based systems for atmospheric environment analysis
- Evaluation and validation of satellite observations on atmospheric components and PMs concentration
- Assessment of the impact of urbanization and fossil energy on atmosphere environment
Goal 11. Make cities and human settlements inclusive, safe, resilient and sustainable

ICWG III/IVa: Disaster Assessment, Monitoring and Management

Some of ToR:

• Generation of vulnerability and hazard zone maps for different type of disasters, such as forest fire, cyclone, floods, drought, volcano eruptions, earthquakes, landslides etc. and identification & assessment of potential risk zones

WG III/9: Cryosphere and Hydrosphere

Some of ToR:

• Develop early warning systems for natural disasters like droughts and floods
DRR – example: papers dedicated to landslides

**LANDSLIDES EXTRACTION** FROM DIVERSE REMOTE SENSING DATA SOURCES USING SEMANTIC REASONING SCHEME

- Landslides Extraction, Semantic Reasoning, High Resolution Imagery

**SPATIAL RESOLUTION EFFECTS OF DIGITAL TERRAIN MODELS ON LANDSLIDE SUSCEPTIBILITY ANALYSIS**

- Landslide, Susceptibility analysis, Certainty factor, Remote sensing

**COMPARISON of FUZZY-BASED MODELS in LANDSLIDE HAZARD MAPPING**

- Landslide, Fuzzy-based Models, Quality Sum Index, Accuracy
DRR – examples: papers dedicated to floods

GOVERNMENT PARTNERSHIP TOWARDS EFFECTIVE APPLICATION OF GEOSPATIAL TECHNOLOGIES FOR SMARTER FLOOD DISASTER MANAGEMENT

Geospatial technology, Flood, Disaster management

3D GIS FOR FLOOD MODELLING IN RIVER VALLEYS

flood modelling, CityGML, laser scanning, 3D geometry modelling

INFLUENCE OF DEM IN WATERSHED MANAGEMENT AS FLOOD ZONATION MAPPING

GIS, DEM, Drainage Pattern, Flash-Floods

OPEN SOURCE WEB-BASED SOLUTIONS FOR DISSEMINATING AND ANALYZING FLOOD HAZARD INFORMATION AT THE COMMUNITY LEVEL

Web-based Solutions, Flood hazards, Information Dissemination, Community-level Hazard Assessment
DRR – examples: papers dedicated to drought

**DROUGHT FORECASTING** BASED ON MACHINE LEARNING OF REMOTE SENSING AND LONG-RANGE FORECAST DATA

Forecasting, Machine learning, Long-range forecast, Remote sensing data – NDVI, evapotranspiration

**A PROBABILITY MODEL FOR DROUGHT PREDICTION** USING FUSION OF MARKOV CHAIN AND SAX METHODS

Markov Chain, Drought, Remote Sensing

**FORECASTING AND MONITORING AGRICULTURAL DROUGHT** IN THE PHILIPPINES

Remote Sensing Applications, Agriculture, Drought, Natural Hazards
DRR – examples: papers dedicated to volcano

3D VISUALIZATION OF VOLCANIC ASH DISPERSION PREDICTION WITH SPATIAL INFORMATION OPEN PLATFORM IN KOREA

modelling and visualisation
FOOD VULNERABILITY AND ALLUVIAL FARMING FOR FOOD SECURITY IN CENTRAL DRY ZONE AREA OF MYANMAR

Food vulnerability map, alluvial farming
Some results dedicated to space technology applied for detection of air pollution by ISPRS

**WG III/8: Remote Sensing of Atmospheric Environment**
Air Pollution: Surface $\text{PM}_{2.5}$ from satellite observation

500m $\text{PM}_{2.5}$ estimation using MODIS/TERRA&AUQA satellites

Retrieval algorithm

Air Pollution: Surface $\text{PM}_{2.5}$ from satellite observation

**Hourly PM$_{2.5}$ estimation using AHI/Himawari-8 satellite**

- **AOT**
- **Angstrom exponent**
- **Assumption:** Log-normal size distribution (as same assumed in satellite retrieval)
- **Columnar Mass concentration**
- **Fine (d<=2.5µm) to coarse mode ratio**
- **Columnar PM$_{2.5}$**
- **CALIPSO**
  - **Aerosol vertical profile**
- **Retrieval algorithm**
- **Surface PM$_{2.5}$**

Pradeep Khatri (Tohoku University)

AOT (December, 2016 – February, 2017)

Surface PM$_{2.5}$ (December, 2016 – February, 2017)

Unit: ug/m$^3$
Air Pollution: Surface NO$_2$ from satellite observation

- OMI satellite tropospheric NO2 columns together with ambient monitoring and meteorological data are used.
- A geographically and temporally weighted regression model is introduced.

Ozone Monitoring Instrument (OMI)

Air Pollution: Estimation of power plant CO\textsubscript{2} emissions by using DMSP/OLS satellite nighttime light data

DMSP/OLS satellite
DMSP : Defense Meteorological Satellite Program
OLS: Optical Linescan System

Night time stable light for 1999

Saturation light correction method

Reference:
Air Pollution: Estimation of power plant CO₂ emissions by using DMSP/OLS satellite nighttime light data

Flowchart for estimating power plant CO₂ emission

(Letu et al., 2014, ESTL)
Conclusion

The way in which UNOOSA could work with ISPRS and other networks, groups and partnerships in the implementation of the Space 2030 agenda

Outputs of ISPRS members working in remote sensing:

1) detection of the actual events, situations
2) forcasting, models for future situations as prevention

ISPRS shares the knowledge and experience – by UNSPIDR GP STAR project
can share the knowledge and experience via – links to publications/authors, e.g.
Thank you

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