



Global Alliance of Disaster Research Institutes (GADRI) Disaster Prevention Research Institute (DPRI), University of Kyoto

12-16 October 2015, Kyoto, Japan

GLOBAL EXPOSURE MAPPING FOR CRISIS MANAGEMENT





Background

- European Commission JRC supports R&D
 - automatic satellite image data interpretation for Global Human Settlement Layer (GHSL)
- Data revolution Open Science (Open Access).
 - Access to global high-resolution satellite data (Landsat, Sentinel) is free, full and open for the broad Regional, National, European and International user community
- Automatic image information retrieval
 - Possibility to process consistently global fine-scale information
 - Sustainable information production
 - Information democratization
 - Open, public and reproducible information





Global Human Settlement Layer (GHSL) Use scenarios

- Integration with environmental, socio-economical and census data
- Information supporting policies
 - Information for action, policy
 - Evidence-based policy support
- Core Applications
 - damage and reconstruction assessment, impact assessment, disaster early warning and alerting, losses estimates, exposure and risk mapping and post-disaster need assessment (PDNA)



2014 – first tests on automat. assessment of global built-up areas using Landsat data GLS1975,GLS1990,GLS2000, and 2014 JRC collection 15,30,75-m-res input

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GLS1975, GLS1990, GLS2000, and 2014 JRC collection 15, 30, 75-m-res input

New methods on (old) data create new information



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Low-level abstraction improve semantic interoperability

What we detect: "built-up area" = all spatial units (30x30m) where a building or part of a building can be recognized

fine-scale sensors are necessary for settlement mapping information bias-gain : f(scale[target, sensor])

Sensor value-added: MERIS GLOBCOVER – Landsat GHSL

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Landsat GHSL: first available global dynamical assessment



1975 -----2014

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New information / methods allow to describe global settlement dynamics

1975 ------2014

Legend MT.vrt Value 0 nodata 1 water 2 not built 3 from 2000 to 2014 4 from 1990 to 2000 5 from 1975 to 1990

Dallas, US 1975-1990-2000-2014

20 Kilometers



Global population and built-up areas evolution in the last 40 years.

Built-up areas are estimated by the JRC GHSL using Landsat input imagery Population estimates are extracted from the World Bank data







Integrating satellite and census data

Pop. Exposure - Methodology for Pop. disaggregation:





Source: McManus et al., Lessons Learned from the production of Gridded Population of the World Version 4 (GPW4), EFGS 2014.



Source: Sort, Digital Olda, Casego, Foulaid, USDA, USOA, ASY, Catmipping, Aarogrid, IOH, IOP, awleshops, and the Old Usar Community

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Sendai, Japan GHSL-GPW gridded population 2015

Shiphigahama

250m grid

Sendai

Nator

varaShibata

Source: Earl, Digital Olicoa, Galago, Tautada, USDA, UBOS, A.S.Y., Galmapping, Awagnti, KON, KAP, awlastops, and The Gill User Committenty

Nagasaki Bay GHSL-GPW population grid 1990 250m grid

ura

asebo

Nagasaki Bay GHSL-GPW population grid 2015 250m grid

ura

asebo

map -





Value added of fine-scale exposure data

Sinigallia, Italy, Flood impact zone Copernicus Emergency Management Service (EMS) Mapping Service

Exposure source: LandScan global population grid, 30 arc-seconds (approx. 1Km equator

Freire, S.; Kemper, T.; Pesaresi, M.; Florczyk, A. & Syrris, V., 2015. Combining GHSL and GPW to Improve Global Population Mapping. Proceedings of 2015 IEEE International Geoscience & Remote Sensing Symposium (IGARSS), 26-31 July 2015, Milan Italy, IEEE, 2015, 2541-2543.





20 October 2014

Joint Research Centre



Conclusions and Outlook

GHSL data is public, free and open

- Global complete, fine-scale, national/admin borderless (agnostic)
- Produced also in low-income countries where no census data is available
- GHSL provides good proxy for population disaggregation
- Global GHSL-based pop. grids are produced for

1975, 1990, 2000, 2014, 2015+

- Simple, consistent approach is favored
- Population restricted to BU areas, and density proportional to amount of BU
- Global, open, fine-scale, dynamical population grids for exposure mapping





On-going pre-release sharing in the GHSL data inside the working group GROUP ON EARTH OBSERVATIONS

Join us! martino.pesaresi@jrc.ec.europa.eu

THANKS





GHSL contributors (May 2015)

- M. Pesaresi action leader, method design, coordination & planning
- D. Airaghi IT support
- D. Ehrlich application development risk and exposure
- S. Ferri system development European data processing
- A. Florczyk system development web services and data integration
- S. Freire methodological development population modelling
- F. Haag image interpreter quality control and validation
- M. Halkia application development European regional analysis
- A.M. Julea algorithm development image processing
- T. Kemper application development IDP camps, slums, vulnerability
- V. Syrris algorithm development distributed computing
- P. Soille algorithm development distributed computing
- L. Zanchetta IT support, computing infrastructure design





Acknowledgements:

Data Discovery - D

DAACs - Community -

Science Disciplines +



• CIESIN - SEDAC, Columbia University (USA)

- Gridded Population of the World
- Kytt McManus et al.

