SyeC
Supercomputación y eCiencia

COEGSS - Center of Excellence for Global Systems Science

Fco. Javier Nieto, April 2017

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Global Systems Science

- "The vision of Global Systems Science (GSS) is to provide scientific evidence to support policy-making, public action and civic society to collectively engage in societal action." (https://ec.europa.eu/digital-single-market/en/global-systems-science)

- Global systems analysis is required for the governance of systemic risks:
  - Climate change
  - Financial crises
  - Global migration
  - Global Public Health
  - etc…

- CoeGSS → These problems can be solved by **using HPC in a global scale!**

CoeGSS in a Nutshell

- CoeGSS aims at **bringing together HPC and GSS** communities in order to address global systems challenges

CoeGSS
Centre of excellence for
GLOBAL SYSTEMS SCIENCE

- CoeGSS aims at **bringing together HPC and GSS** communities in order to address global systems challenges
- Establish an advanced innovative HPC soft- and hardware infrastructure as a one-stop-shop for stakeholders
- Enable the processing and analysis of big heterogeneous GSS-relevant datasets
- Provisioning of the needed technical HPC environment for GSS
- Provisioning of the necessary legal and economic frame for GSS on HPC
- Set-Up and maintenance for GSS stakeholders support
- Partners: Univ. Potsdam, GCF, USTUTT, PSNC, ISI, IMT, CHALMERS, ATOS, TOP-IX, COSMO, DIA

CoeGSS Challenges

- Talk different language
  - GSS and HPC communities came from totally different fields
  - Need to understand each others' requirements and needs

- Find, manage and use data
  - Adequate data for the simulations is hard to find
  - Use data from different sources and with different formats
  - How to deal with incomplete datasets and other issues?
  - How to manage data for doing the simulations?

- Lack of tools ready for HPC
  - Typical tools are not tailored for parallel processing
  - Tried with Pandora → Space partitioning vs Graph partitioning + I/O issues
  - Not all cases may require (pure) HPC

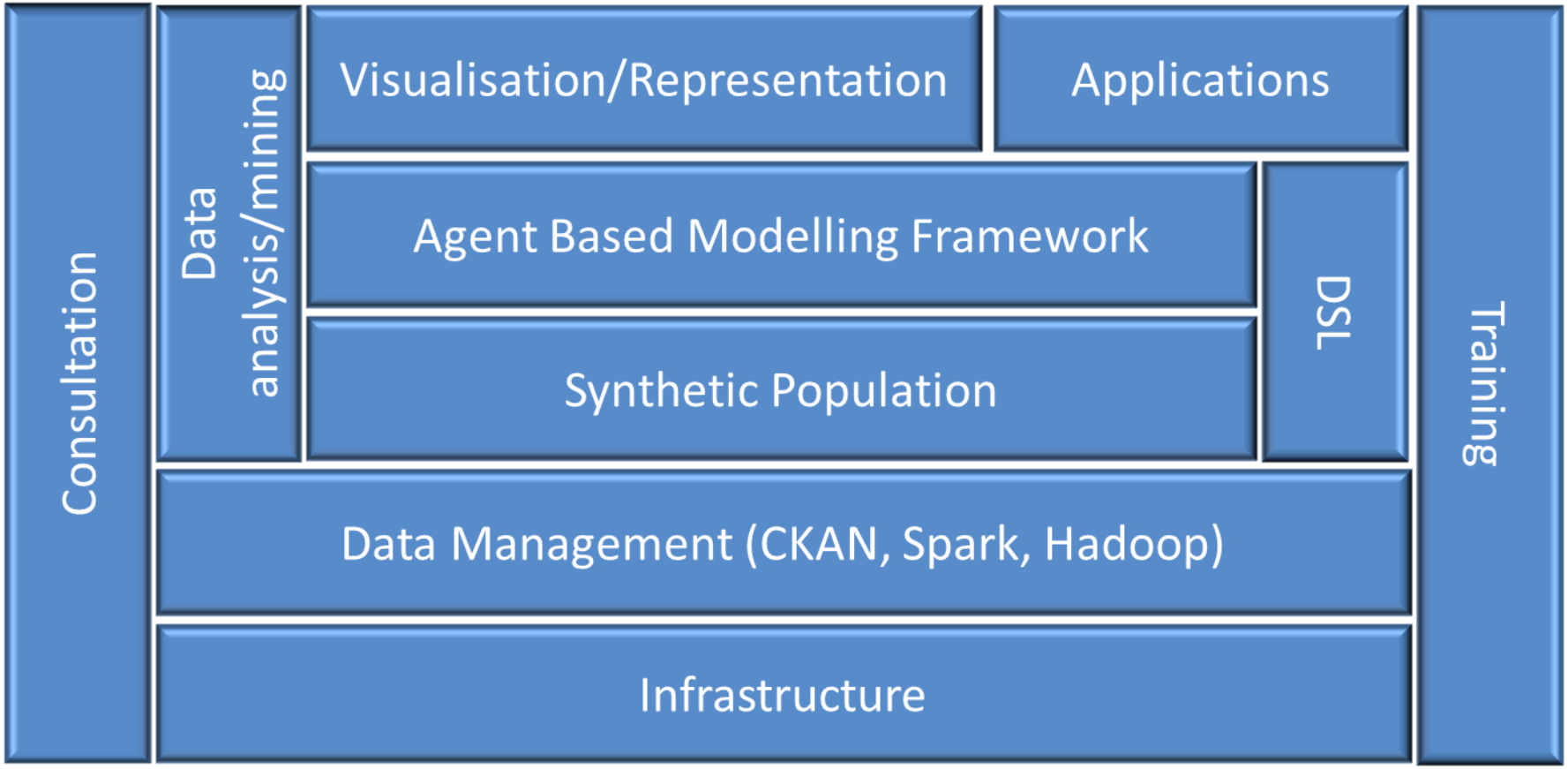
CoeGSS Scenarios

- Green Growth (GCF)
  - Synthetic information system (SI) for investigating the global diffusion of green growth initiatives
    - policy measures (feed-in tariffs, building regulations)
    - business strategies (brands for electric vehicles, developing apps for healthy habits)
  - A key question: the relation between price mechanisms and other drivers of social diffusion

- Health Habits (ISI)
  - Monitor and analyse the global diffusion of health-relevant habits (smoking, overeating, physical exercise, sleeping, etc.)
  - Explore the similarities and differences between epidemic contagion and health habits diffusion
  - Mobile App. for gathering information (InfluWeb)

- Global Urbanisation (CoSMo)
  - Enhance information system for global urbanisation to investigate the systemic impact of infrastructure decisions
  - Proprietary application → To apply parallelization in order to scale up

CoeGSS Research Activities (I)



CoeGSS Research Activities (II)

- Tool for ABMS in HPC
  - Provide a tool ready for HPC execution (MPI) to scale up problems solving
  - Some adaptations for Pandora done (mainly I/O) → Problem partitioning: space based
  - Needed to have a graph-based partitioning → Represent social relationships

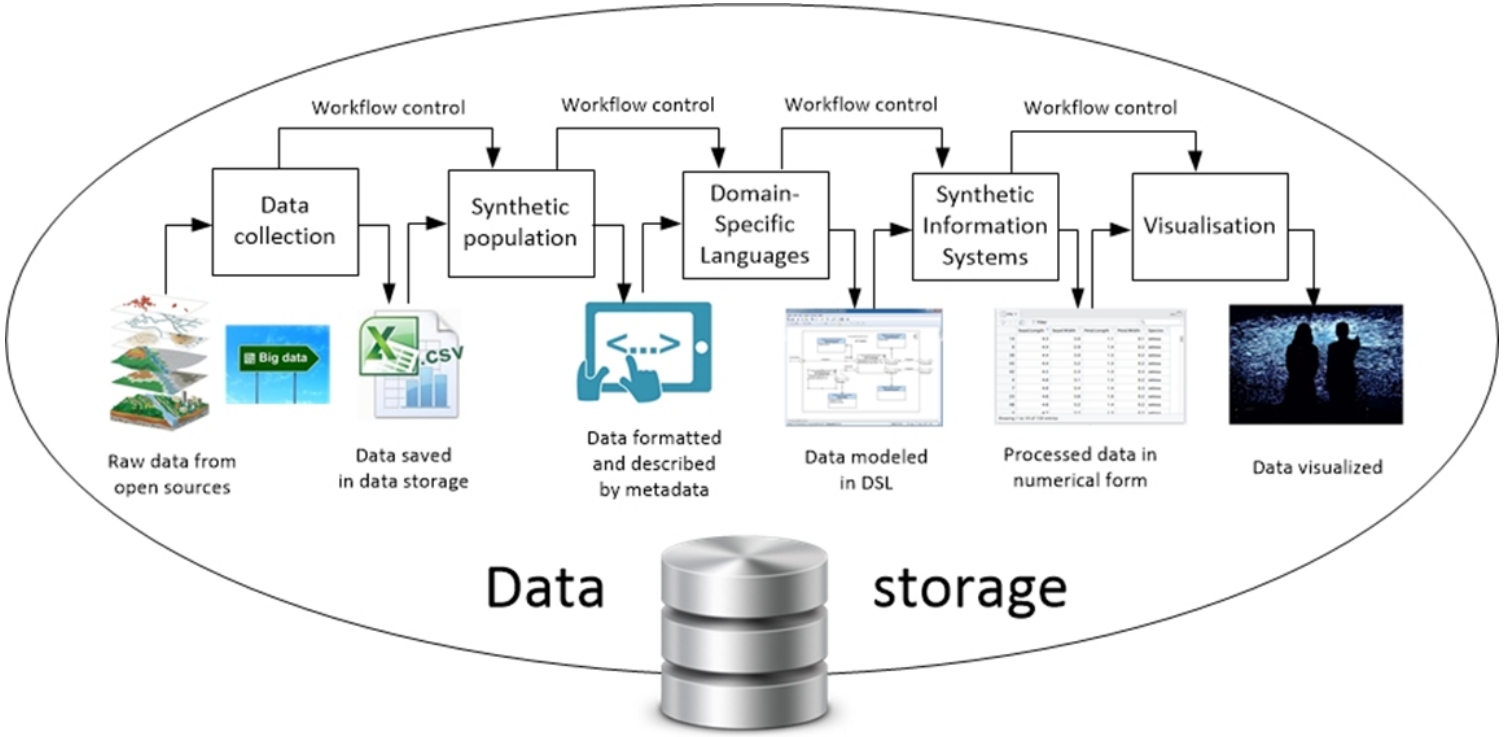
- Synthetic populations generation
  - Start with a limited number of data representing the context
  - Generate larger datasets in order to populate the agents → Extrapolate
  - Auto-generate input for the ABM tool

- Big Data Analysis → HPDA
  - Where is Big Data useful? → Pre/post processing
  - Several tools analysed → Intention to use Apache Spark (although not so HPC ready)
  - Still under research

- Visualization
  - Provide remote and immersive visualization methods
  - Integrate 2D and 3D visualization systems

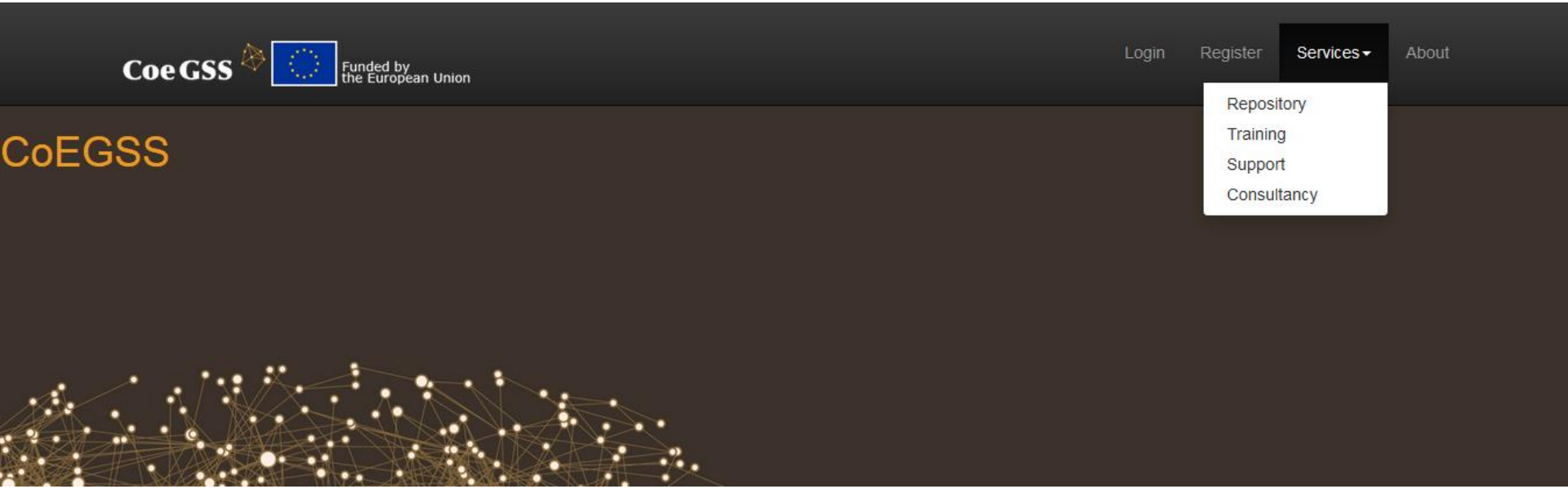
CoeGSS Research Activities (III)

- Simulation workflow



CoeGSS Research Activities (& IV)

- CoeGSS Portal



Future of CoeGSS

- Ongoing and future developments
  - Work on the DSL part
  - Progress in the implementation of the ABM tool
  - Clarify the role of HPDA and implement
  - Improve the Portal → Add functionalities
    - HPC access
    - Marketplace
    - Integration of other features (i.e. visualization)

- Sustainability
  - Take a decision about business models
  - Look for the way to go on after the project ends

Thank you

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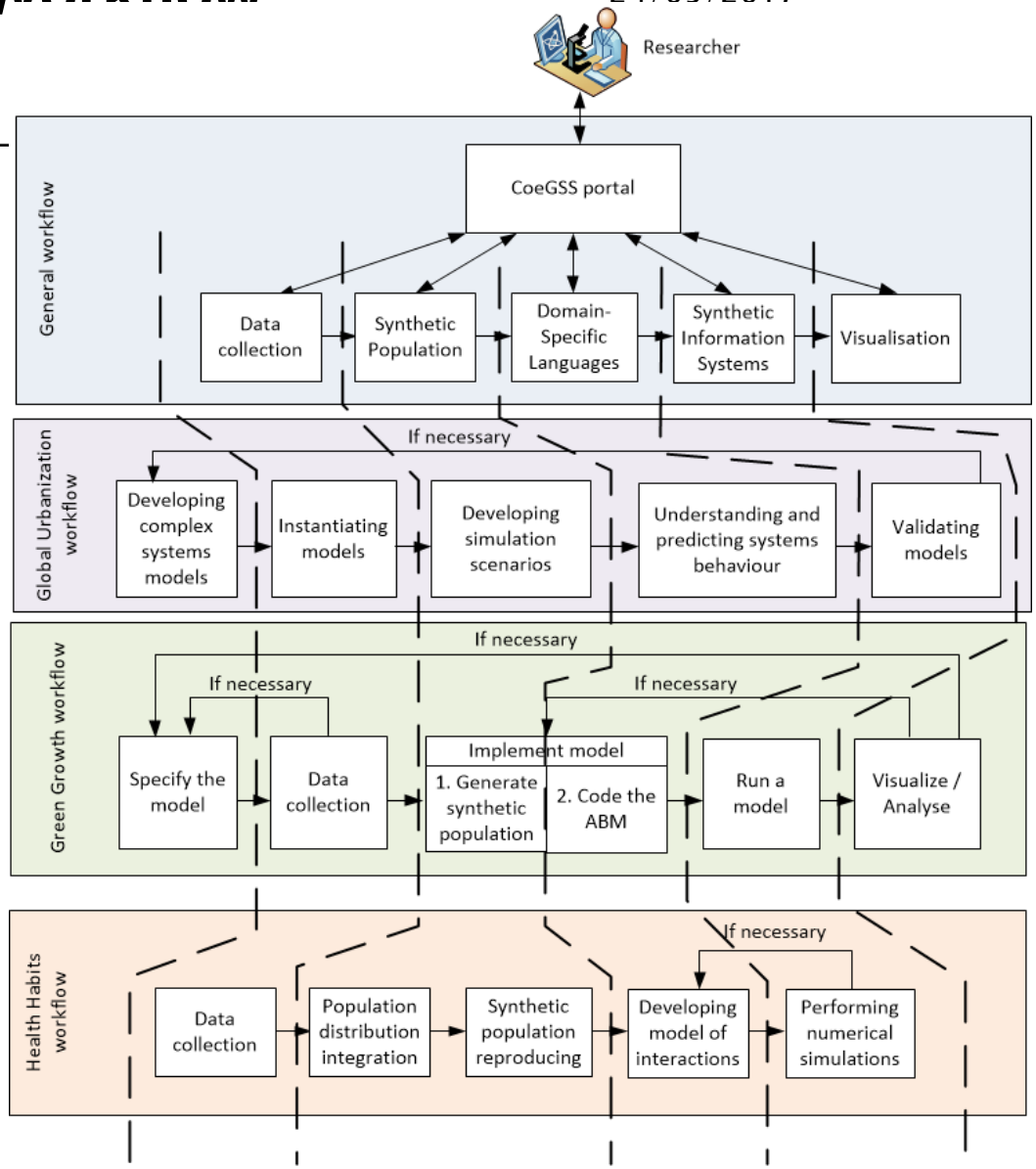
WP3 Progress (II) - Workflow

- Analysis of the control and data flow for all three pilots
- Generalization attempts in order to use similar approach to all use cases
- Process of analysis is described in D3.2



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