FET Flagship on:

Computational Sustainability

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Brief description of the idea

Sustainable Development

Sustainable development is development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs.

– Brundtland Commission, United Nations, 1983.

Computational Sustainability

Computational Sustainability is an interdisciplinary field that aims to apply techniques from computer science, information science, operations research, applied mathematics, and statistics for balancing environmental, economic, and societal needs for sustainable development.

– http://www.computational-sustainability.org

Ambition

Goals

1. To create a broad-based research programme in the area of computational sustainability that integrates "islands' of research across Europe into more strategically aligned initiatives;

2. To provide a European-based "counter-balance" in the context of significant recent progress in the United States in this area. The objective is not to compete, but to be complementary, and leverage the success achieved in the USA thus far, and build upon European scientific competencies;

3. To address key European sustainable development issues through computational and mathematical advances;

4. To create, support and foster a European-centred scientific community in the area of computational sustainability.

Impact – (from the agenda of the 2010 CompSust Conference at MIT)

Human built systems and impact

design, optimization, modeling and impact monitoring of human built systems; transportation, energy and resource management; enewable energy; mining; housing and infrastructure; urban planning and land use; sustainable communities and cities; methodologies for developing countries; measurement of economic, environmental, and societal impacts.

Ecosystem modeling, monitoring and management

sensors and sensor networks; models of ecosystem structure and function; species distribution and migration; invasive species; emerging diseases; and ecosystem services; policy and decision making for managing the atmosphere, water, soils, fisheries, forestry, and agriculture; Pollution management; greenhouse gas emissions; toxic pollutants; and agricultural runoff.

Economics and human behavior

modeling, decision making, management policy and mechanism design; human well-being, poverty and disease, and over-population.

Integration

Opportunities for Translational and Multidiscipinary Research

1. Computer Science
2. Operations Research
3. Applied Mathematics and Statistics
4. Economics
5. Energy
6. Environmental Science
7. Physics, Biochemistry, Ecology, Botany, etc.

International Integration

An NSF-funded Expedition Award of $10m has funded the establishment of the Institute of Computational Sustainability at Cornell University, led by Professor Carla Gomes – `http://www.cis.cornell.edu/ics/`

Plausibility

Building on European Competence

European researchers have excellent reputations in constraint programming, combinatorial optimisation, datamining, machine learning, decision support tools, computational social choice, etc.

Existence Proof – Strong NSF-funded Community in the USA

- Institute for Computational Sustainability – led by Prof. Carla Gomes (Cornell), but involving several other universities, government agencies, etc.
- CompSust – International Conferences in 2009 (Cornell) and 2010 (MIT)
- CROCS – International Workshops in 2009 (with CP) and 2010 (with CPAIOR)

Support

Growing European Communities, opportunities for integration, e.g.

- **Ireland** – University College Cork, Treemetrics (SME), successful national funding agencies (e.g. Science Foundation Ireland), growing GreenTech industry.

- **UK & France** – Microsoft Research (Dr. Youssef Hamadi) co-heads the Optimisation for Sustainable Development Chair at the École Polytechnique – `http://chaire-osd.polytechnique.fr/`

- **Germany** – Technischen Universität München (Dr. Martin Sachenbacher) works on eletro-mobility; University of Dresden on forestry management, etc.

- **Many others** . . .

- **European/National initiatives**: sustainable energy, sustainable transport, smart cities, smart electricity grids, biodiversity assessment, forestry management, carbon management, etc.

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