G-eau JOINT RESEARCH UNIT

Water Resource Management, Actors, and Uses

Water has for centuries reuqired developments, organisation dedicated to technical discoveries, and social, political and economic evolutions. Today, the competition around water and land resources is rising, fuelled by climatic uncertainties and changing public policies.
Research led by the Water Resource Management, Actors & Uses joint research unit (Cirad, IRD, Irstea, AgroParisTech, Montpellier SupAgro) pursue four major objectives:

- Propose methods and planification tools for water management at the catchment or aquifer level (integrated Resource-Uses models);
- Improve the coordination of sectorial policies, territorial and water management/development in the context of diverse and often concurrent uses, involving muliple stakeholders;
- Provide managers with the means to improve the performance of collective and individual water services (agricultural water, drinking water and sanitation), through the use of hydraulic and automatic regulation tools, economic instruments, and dialogue with local community representatives, and participatory media;
- Develop innovative irrigated agricultural systems less sensitive to hazards (markets, climate...) capable of reducing environmental risks and offering greater economic value for water.

Its scientific and technical partners are in France, Europe and abroad (Northern Africa, Sahelian and Southern Africa, South East Asia and South America).

Scientific Fields

The G-eau research unit specialises in three disciplines: **Science & Technology, Life and Environmental Sciences, Human and Social sciences.** The research unit also mobilizes expertise on interfaces, i.e. methods to relate and combine heterogeneous knowledge, as produced in the three disciplines mentioned above, to address **interdisciplinary issues.**

Applications

- → Hydraulic management of water transfers
- → Water resource allocation
- → Dialogue and public participation
- → Public policies (water, agriculture, environment and government territories)
- → Water related risks
- → Public sanitation and irrigation services
- → Crop and irrigated crop systems

Our Teams

The skillset in our research unit are assembled within **teams** centred on specific projects. These groups address a particular perspective on water, a valuation system, a specific process or regulation tool or methodological questions. Interactions between teams are fostered by project collaboration and by consolidating advances within each scientific discipline.

The G-eau joint research unit is organised into 10 teams:

- Hydraulic management, optimization and supervision of water transfers (GHOSTE)
- Optimising irrigation technologies and steering practices: minimising inputs and environmental transfers (OPTIMISTE)
- Controversies and public actions (CAP)
- Innovations and changes in irrigated agriculture (INCA)
- Tools and governance of water and sanitation (OGEA)
- Sociohydrological dynamics of water territories (socio-Hydro)
- Water and societies interrelated dynamics: adaptations (Adaptations)
- Participation for water management (PAGE)
- Experimental analysis of sociohydrological dynamics and regulations (AnExpe)
- Evaluation: creating and using indicators (EVE)

Human and Technical Resources

- The G-eau joint research unit consists of around **75 permanent members**
  - → 2/3 scientists (academic and research staff)
  - → 1/3 engineers, technicians, and administrative staff
- About **50 PhD, post-doc, foreign researchers and interns**
- **Notable scientific equipment/laboratories**
  - → Experimental irrigation station at Lavalette (Montpellier
  - → Research trial laboratory on irrigation materials
  - → Gignac experimental canal, equipped to study automatic regulation of canals
  - → Active partnerships on instrumented sites across catchments in the South

AgroParisTech cirad IRD irstea Montpellier SupAgro

Sample results and products

- Automatic multivariable robust controllers for real time management of irrigation canal structures
- Hydraulic simulation software to model irrigation canals and design automatic controllers - Simulation Irrigation Canals (SIC)
- Characterising nitrogen pollution risks under furrow and sprinkler irrigation, accounting for soils and inputs heterogeneity within plots
- Normalised methods to characterize irrigation materials performance under drip and sprinkler irrigation
- Developing small scale localised irrigation to facilitate multi-use water sharing (Indonesia)
- Role play and agent-based modelling to facilitate dialogue between irrigated perimeter managers (Senegal, Morocco) or between water management stakeholders (France, Uganda)
- Wat-a-game WAG kits providing method & tools to simulate and facilitate catchment water management
- Analysing constraints and potentialities of economic tools (pricing, water markets...) to satisfy varying objectives of water management and associated services
- Methods to estimate water demand of different sectors (water supply, irrigation) across spatial and temporal scales and analyse the associated service costs
- Software to optimise the hydraulic development of large rivers (Senegal river basin)
- Comparing natural and artificial aquifer recharge in semi arid areas (Northern Africa)
- Settling conditions and vulnerability of people and activities in flood risk zones

Participation in research programmes

→ EU FP7 projects (Eau4Food, Wassermed, Afromaison, Wetwin)

→ National Research Agency (ANR)

→ CGIAR Challenge Programme on Water & Food

→ Belmont Forum

Teachings and professional training

The joint research unit staff contribute to the following:

- MSc (Master and Mastère): 1500 to 2000 teaching hours (2/3 in the North as part of the curriculum of 2 G-eau member institutes (AgroParisTech and Montpellier SupAgro) and in the Montpellier University Master Eau, 1/3 in the South with expatriate researchers contributing to regional academic institutes).
- Engineering schools: ENSEEIHT, ENGEES, Polytech Montpellier
- Teaching and research chair "Water for All", sponsored by the Suez Environment foundation.
- PhD: the joint research unit is involved in 4 doctoral schools: SIBAGHE and EDEG (Montpellier), ABIES (Paris), Physics, Modelling, and Engineering Sciences (Marseille).

Key Partners

- Socio-economic partners

Agriculture and Environmental Ministries - Foreign Affair Ministries - AFD - European Commission – Local authorities - Water agencies – ONEMA - Irrigated perimeter managers - Engineering companies - AFEID.

- French scientific partners

Pole EAU – Montpellier University and Université Paul Valery – Toulouse III University – CGS de l'Ecole des Mines Paris – INRA – CNRS – LTHE Grenoble.

- In Europe and in the rest of the world

International Water Management Institute (IWMI) - Wageningen Univ - CSIRO and ANU (Australia) - INAT - INRGREF (Tunisia) - IAV Hassan II (Morocco) - Universities of Dakar (Senegal), and Prétoria (South Africa) - World Bank - AIT Bangkok.

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