DECENNIAL REPORT BROCHURE

Construction Engineering and Water Networks Management Laboratory

EUPALINOS

CONSTRUCTION ENGINEERING AND WATER NETWORKS MANAGEMENT LABORATORY

2004 - 2014

We Pride Ourselves, for Who We Are and What We Do.

Multi-Faceted Research Themes

Construction engineering and management, building information models (BIM), urban water distribution networks (UWDN), transport networks.

Internationally Recognized

Over 80 scientific journal and conference publications, national and international committee memberships, reviews for over 30 scientific journals and granting agencies.

Competitively Funded

Research grants from, among other, the Research Promotion Foundation (Cyprus), and the European Union's Seventh Framework, Marie Curie and Interreg Programs.

Theoretical and Applied Research

Intertwined theoretical and applied research themes, driven by both scientific inquisition and local industry needs, on contemporary topics of local and international interest.

Multi-Disciplined Research Staff

Multi-disciplined and complimentary in skills research staff, of post-doctoral associates, graduate and undergraduate students, research associates and administrators.

Dissemination

Continuous dissemination to the scientific, industry and public communities through scientific publications and presentations, seminars, academic courses, and workshops.

EUPALINOS
CONSTRUCTION ENGINEERING AND
WATER NETWORKS MANAGEMENT LABORATORY

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Contents

We trust that in our short presence at the University of Cyprus we have become an active and productive member of the University's scientific and research community, with an ever-reaching international footprint and recognition of our work amongst our peers.

Dear Reader,
In this short report/brochure, we tried to encompass snapshots of our young, yet full and fruitful, 'research life' as the "**EUPALINOS - Construction Engineering and Water Networks Management Laboratory**". It's been 10 years already (2004-2014), and what began as a 2-person research group at the then just-started University of Cyprus's School of Engineering has since blossomed into a full-blown research group of about 10 active researchers funded through external research grants and involved in a variety of research areas.

We warmly invite you to not only peruse this report, but more importantly to visit us online, to review our work, and to share your thoughts with us on the topics listed herein, and on any other topic you think may relate to their content.

Symeon Christodoulou
Assoc. Professor, EUPALINOS Lab Director

The EUPALINOS Lab in Brief

EUPALINOS is a laboratory of construction engineering and of urban water distribution networks (UWDN) management, focused on scientific and industrial research pertaining to these thematic areas. The EUPALINOS Lab is affiliated with the University of Cyprus's Department of Civil and Environmental Engineering and with the NIREAS International Water Research Center (Nireas-IWRC), it is coordinated by Dr. Symeon Christodoulou and has been the host of several nationally and internationally funded research projects in construction engineering and management, building information models, water distribution networks, and transportation networks.

We trust that in our short presence at the University of Cyprus we have become an active and productive member of the University's scientific and research community, with an ever-reaching international footprint and recognition of our work among our peers. National and international research grants from Funding Agencies such as USA's National Science Foundation (NSF), EU's FP7 Framework Program, EU's Marie-Curie Program and the Interreg Program, active participation in EU-wide organizations (such as COST's Domain Committee on Transport and Urban Development), and international awards for our work, attest to our scientific standing.

Executive **Summary**

The Lab is founded on three equally important research pillars: (1) fully integrated and automated project processes in the management of construction, with an emphasis on building information models (BIM), (2) rehabilitation of urban infrastructure and risk analysis, with an emphasis on urban water distribution networks, and (3) information technology in construction engineering and management. Examples of past and current research projects range in topics, as follows:

- *Construction Engineering and Management*
  building information models (BIM), building energy efficiency, resource-constrained scheduling, and competitive bidding, decision-support systems.

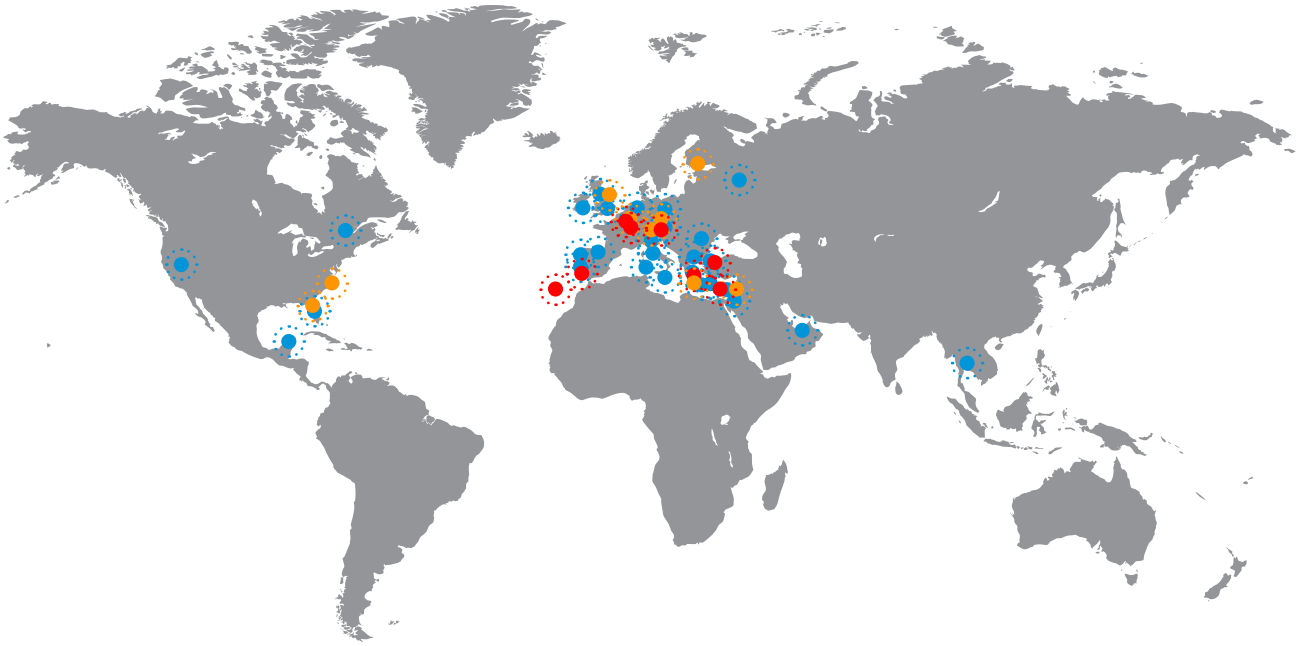
- *Urban Water Distribution Networks (UWDN)*
  risk-of-failure assessment, waterloss management, path routing, waterloss sensor development and sensor placement optimization, automatic meter reading, spatio-temporal analysis, and reliability/vulnerability of piping networks.

- *Transportation*
  vulnerability of transport networks, path routing, track-and-trace of dangerous cargo, and integrated platforms for security, information and accessibility in intelligent multimodal transport.

Executive **Summary**

This past decade saw EUPALINOS Lab represented in many international conferences and participating in several research consortia, with the Lab's research associates "spreading the Lab's word" across the globe.

Amongst the most notable recognitions of the Lab's work were a Presidential Praise (2008) for work done on waterloss management in Cyprus, and the election of the Lab's Director (Dr. S. Christodoulou) as the national representative on EU's COST Domain Committee for Transport and Urban Development (2007-2013).



1
EUPALINOS conference presentations (2004-2014)

2
EUPALINOS project meetings (2004-2014)

3
Committee meetings (2004-2014)

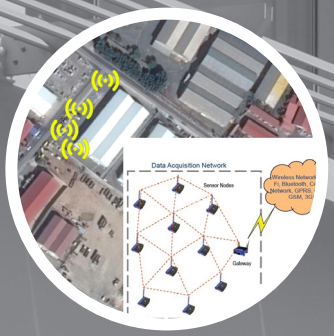
The total project budgets allocated to EUPALINOS since 2004 are in excess of 1.4 million euro. Currently a visiting Fulbright Scholar, a post-doctoral and two research associates, one PhD candidate, two PhD students and a number of graduate students are actively involved in various projects in the lab, with research work from the current and past research groups of EUPALINOS already published in several journals and conference proceedings, an edited proceedings book (Springer), two book chapters and two special issues of high-impact scientific journals.

2004

Start of EUPALINOS research group

2006

Recipient of 2 national research grants, (projects "EDRISENSE" and "VIRTUALITY") by CyRPF; Recruitment of 1st PhD candidate



20

UCY research (project

Archimedes Research Center for Structural and Construction Technology (startup fund); First national research grant, (project "EDRISYS") by CyRPF

2005

Dr. Christodoulou is elected as Cyprus's National Representative on the COST Domain Committee for Transport and Urban Development

2007

Creation of the Nireas International Water Research Center, through co-funding by by the European Regional Development Fund and the Republic of Cyprus

2009

Hosting in Cyprus of the European Water Resources Association's Seventh International Conference

2009

Recipient of 1 national research grant, (project "MSAD") by CyRPF

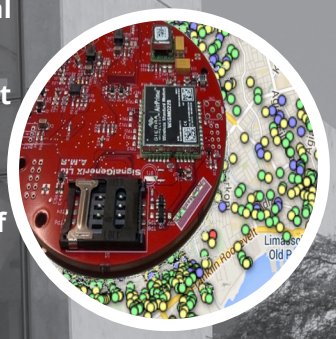
2009

08

grant
"BUS")

2010

Recipient of 1 European (project "BIMAutoGen") and 1 national research grant, (project "UCyAMR") by CyRPF; Graduation of EUPALINOS's first PhD candidate



2012

Successful completion of the "MSAD" and "UCyAMR" research projects

Successful completion of the EDRISYS, EDRISENSE, and VIRTUALITY projects; Move to Nireas-IWRC's facilities

2011

2013/14

Recipient of 1 European research grant (project "PRODROMOS") and participation in another European research project (project "ISES"); Graduation of EUPALINOS's 2nd PhD candidate

EUPALINOS – The Myth

Eupalinos (Ancient Greek: Ευπαλίνος) or Eupalinus of Megara was an ancient Greek engineer who built the Tunnel of Eupalinos in Samos (Greece) in the 6th century BC. The tunnel, presumably completed between 550 and 530 BC, is the second known tunnel in history which was excavated from both ends and the first with a methodical approach in doing so. Being also the longest tunnel of its time, the Tunnel of Eupalinos is regarded as a major feat of ancient engineering. It was constructed for the tyrant Polycrates of Samos, and was a remarkable 1,036 meters (3400 ft) long. It brought water to the city, passing through limestone at the base of a hill; this tunnel still exists." (source: Wikipedia)

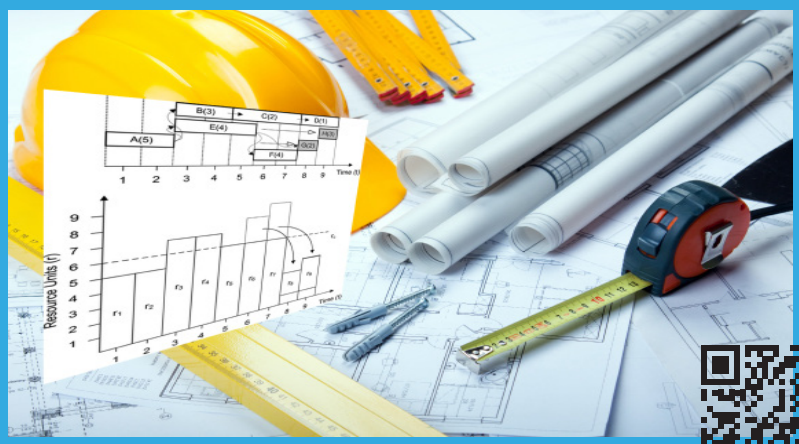
Construction Engineering & Management

Our core competency,
... and the most fun of them all.

Construction engineering and management (CEM) lies at the core of our competencies, and it consumes most of our productive time... well, the term 'productive' is used loosely.

Over the years, we have tried to generate and disseminate knowledge in a number of construction-related topics, ranging in nature from pure management and professional issues, to more mathematical topics. Among the many topics in traditional CEM that interest us, are:

- project scheduling and cost controls,
- construction productivity,
- risk management,
- fully integrated and automated project processes (FIAPP),
- decision support systems,
- competitive bidding and qualifications-based selection,
- construction law, professional issues in construction management and construction education.



Most Notable Research Outputs

Our long-time involvement with construction engineering and management has yielded several research outputs, most notable of which are the following:

- Development of a novel heuristic for resource constrained scheduling (RCSP), based on entropy-maximization and entropy's. maximality and subadditivity properties.
- Development of ant colonization optimization (ACO) heuristics and application to unconstrained and resource-constrained scheduling.
- Development of a method for qualifications-based selection (QBS) of engineering services.
- Expansion of classical competitive bidding models through the use of artificial intelligence and entropy.
- Development of entropy-based cash flow analysis and for unbalanced bidding.
- Decision support systems for the management of construction projects.
- FIAPP in the management of construction. This is in close association with our work on building information models (BIM) and their use for a variety of engineering and/or construction operations (e.g. the a-priori damage assessment, cost estimation and scheduling for post-earthquake building rehabilitation).
- Economic analysis of the effects of the current financial crisis on the construction industry in Cyprus.
- Real-life case studies, such as the Larnaca international airport, and the University of Cyprus's campus development.

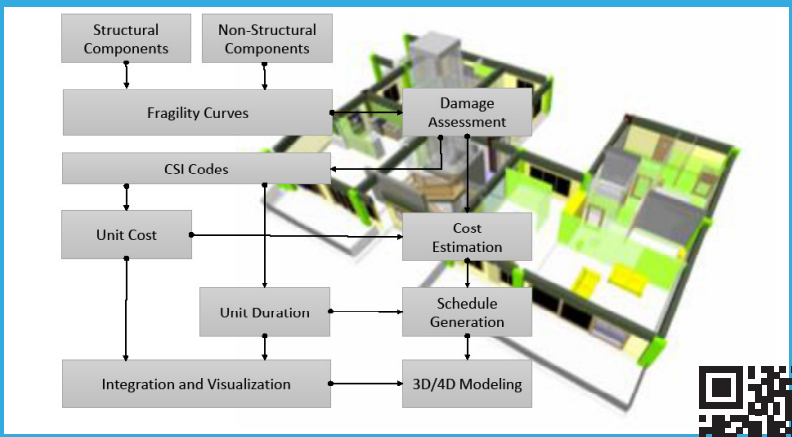
Building Information Models

The hottest thing to hit construction engineering in decades,
... and we simply couldn't be absent.

Proponents claim that BIM offers several benefits, among which: improved visualization; improved productivity due to easy retrieval of information; increased coordination of construction documents; embedding and linking of vital information such as vendors for specific materials, quantities required for estimation and tendering; fastest delivery; reduced costs.

What about us? Where do we stand? Well, we at EUPALINOS try to keep in par with our international peers, engaging in a multitude of research and applied efforts to spread the "BIM word". Some of the work is in collaboration with international counterparts and externally funded, and some of it is work with local partners. Examples are:

- BIM in construction engineering and management,
- BIM-based building energy calculations,
- parametric modeling and automated generation of BIM,
- BIM in education.



Most Notable Research Outputs

Among EUPALINOS's most notable research outputs in this area are the following:

- Development of BIM-based DSS for construction management, combining 3D/4D modeling with custom-developed relational databases and user interfaces for quantity takeoff, cost estimation, productivity calculations, project scheduling and what-if analyses.
- BIM-based damage assessment, cost estimation and scheduling for post-earthquake building rehabilitation.
- BIM-based energy efficiency calculations and risk analysis. This work is part of a european-funded project for the development of ICT building blocks to integrate and complement existing tools for design and operation management into a Virtual Energy Lab capable of evaluating, simulating and optimizing the energy efficiency of products and facilities before their realization, and taking into account their stochastic life-cycle nature.
- Automated generation of parametric building models. This work is part of a european-funded Marie Curie International Research Staff Exchange Scheme.
- Academic course development and instruction at both the undergraduate and graduate levels. Selected BIM topics have also been made part of the undergraduate capstone design course of UCY's Department of Civil and Environmental Engineering.

Urban Water Distribution Networks

A hobby turned 'amore', ...
and then quickly into obsession.

The problem of aging infrastructure and of associated water losses in urban water distribution networks (UWDN) has been one of the biggest infrastructure problems facing city and municipal authorities and a major task in their efforts to achieve efficient and sustainable management of water resources.

Among the many topics related to water distribution networks that are of interest to us, are:

- mathematical and numerical risk-of-failure modeling,
- spatio-temporal analysis and GIS,
- decision support systems (DSS),
- leak detection, sensor development and placement optimization,
- automatic meter reading (AMR),
- component and network reliability of UWDN,
- hydraulic modeling and intermittent water supply.

Most Notable Research Outputs

Our employment with UWDN has yielded several research and industrial outputs, most notable of which are the following:

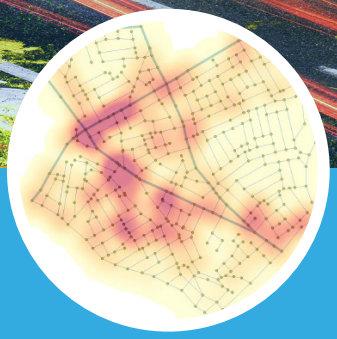
- Analytical, numerical and neurofuzzy modeling of UWDN risk-of-failure metrics.
- DSS for 'repair-or-replace' management strategies.
- Geospatial mapping and spatio-temporal analysis.
- Modeling of leak dispersion in soils, leak detection technologies, sensor development and sensor placement optimization methods. EUPALINOS set up and operates a real-scale water distribution network of about 100m pipe length, fitted with custom-developed sensors and a wireless sensor network (WSN) for monitoring the performance of such sensors.
- Automated meter reading (AMR) hardware (developed by research partner SignalGenerix Ltd.) and software. The AMR device is an add-on module to existing water meters, and it is pioneering in its underlying technology. The software is GIS-based, and linked to custom-developed SQL and SMS-based database systems.
- Hydraulic modeling and investigation of the effects of intermittent water supply on the vulnerability of UWDN.
- Investigation of the seismic vulnerability of UWDN and a friendly amendment to the American Lifelines Alliance (ALA) guidelines, incorporating survival analysis techniques to network modeling.
- Real-life case studies, in collaboration with the Water Boards of Limassol, Nicosia and Larnaca.

Transportation Networks

Seems that we got lost on the way to water distribution networks.

Transportation networks and their vulnerability is a relatively new topic on our research agenda, but a rapidly expanding one. Having taken note of several national and international events, and made the analogy with water distribution networks, we have engaged ourselves in devising methods and tools for assessing the vulnerability of transport networks and increasing their reliability. Among the many topics related to water distribution networks that are of interest to us, are:

- Network vulnerability assessment,
- Bus routing,
- Safety and security in multimodal transport,
- Interconenected networks,
- Track-n'-trace of dangerous cargo,
- Roadway condition assessment and GIS-based DSS,
- Automated crowdsourced systems for roadway assessment.



Most Notable Research Outputs

Our short employment with transport networks has yielded the following research outputs:

- An entropy-based bus routing algorithm, which was utilized in conjunction with university timetabling to investigate traffic impacts and devise bus routes and schedules for UCY's student population.
- Entropy-based and ACO-based vulnerability assessment methods for transport networks. The developed methods and associated software was utilized on subnetworks of the city of Limassol (Cyprus).
- Integrated platform for security, information and accessibility in intelligent multimodal transport. The work primarily aims for the development of systems to be utilized in routing, tracking and tracing hazardous cargo across national and trans-national boundaries, and assessing the interactions and traffic impacts on, and from, such cargo routing.
- Assessment of the vulnerability of interconnected networks (primarily water distribution and transport networks).
- Development of pavement management systems and crowd-sourcing tools for the condition assessment of roadway pavements.
- Development of decision support systems for the operations and management of roadway networks. The developed systems are based on GIS, spatio-temporal analysis, path routing (graph theory), entropy models, and relational databases.

Funded Research Projects

With an over-the-years total funding of approximately 1.5 million euro, the "EUPALINOS - Construction Engineering and Water Distribution Networks Management Laboratory" and its Director have managed to fund scientific and/or industry-driven research on a variety of thematic areas, and to employ several researchers on such projects. A listing of these projects and short descriptions of their scientific goals and outputs, are given in the succeeding pages.

Noteworthy is the increasing funding trend, and our research team's ability to attract grants in a multitude of thematic areas.

2005

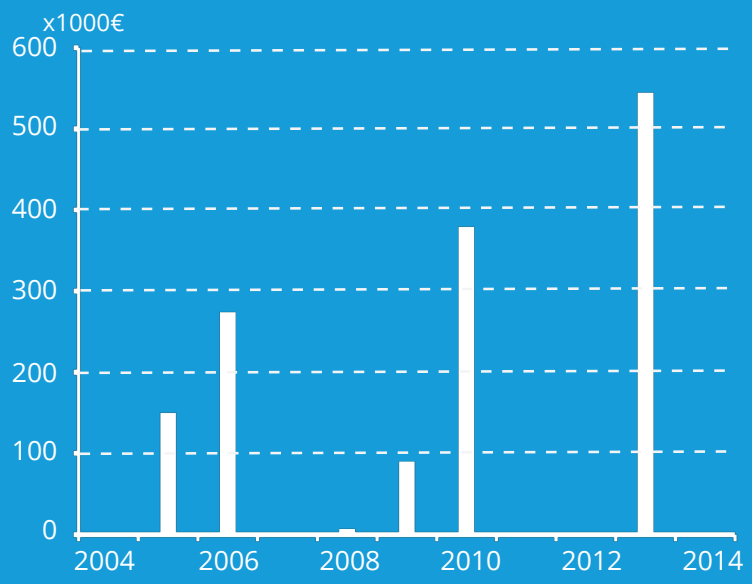
Our first research grant was secured from the Cyprus Research Promotion Foundation in 2005, and it was on water distribution networks.

2010

By 2010, we had been awarded eight research grants, of which one was from the Europen Commission and two were co-funded by the European Regional Development Fund.

2014

In the years that followed, we secured two additional grants (1 from the European Commission and 1 from Interreg).



The research funds won by the EUPALINOS research team and directly assigned to the Lab have also increased over the years, with a 100% sourcing from the European Commission since 2013.

Integrated Risk Assessment and Management of Water Distribution Networks

"EDRISYS" (2005-2007)

Project Overview & Objectives

The need to more intelligently manage water distribution networks (WDN) is increasingly more important to agencies managing such networks and seeking ways to increase the reliability of their systems, the uninterrupted quality service of their "customers" and the cost-efficient operations of the networks. Repair and/or replacement of aging water mains impose major expenditures on already financially strained municipalities, and the need to more actively engage in the monitoring and management of such networks is progressively increasing as existing networks continue to deteriorate.

The project aimed for the development of a framework for the management of WDN based on both analytical and numerical modeling techniques and coupled with GIS for improved visualization. In summary, the project objectives were the following:

- Digitization of historical waterloss data from local Water Boards and knowledge extraction,
- Development of knowledge on water management in Cyprus and transfer of knowledge from abroad,
- Statistical, mathematical and numerical models for waterloss management.

Consortium Partners

- University of Cyprus
- Water Board of Lemesos (Cyprus)
- Water Board of Larnaca (Cyprus)

Project Budget

- 218,000 euro

Funding Agency

The EDRISYS research project was funded by the Cyprus Research Promotion Foundation through the 2004 National Research Call, under Grant No. AKGEN/1204/01.

> Leaks are not the problem; they are the symptom.
>
> The EDRISYS research team (2006).

Leak Detection and Management in Urban Water Networks Using Wireless Sensors

"EDRISENSE" (2006-2008)

> Wireless sensor networks, and sensor placement optimization are simply opposite faces of the same coin.
>
> The EDRISENSE research team (2008).

Project Overview & Objectives

The main objective of EDRISENSE was the development of a Wireless Sensor Network (WSN) for the continuous monitoring of urban water distribution networks (UWDN), and for the early detection of water leaks. The integration and automation of several leak-finding and UWDN management methods is expected to lead to the optimization of the networks' operation. The results of this research, in conjunction with parallel research activities for the development of GIS software will contribute to the reduction of water losses. The EDRISENSE project aimed at the:

- Development of WSN technologies for waterloss management,
- Development of 'repair-or-replace' DSS.

Consortium Partners

- University of Cyprus
- SignalGenerix Ltd. (Cyprus)
- Nicolaides & Associates Ltd. (Cyprus)

Project Budget

223,500 euro

Funding Agency

The EDRISENSE research project was funded by the Cyprus Research Promotion Foundation through the 2006 National Research Call, under Grant No. PLYPH/0506/21.

Sustainable Building Development and Construction Management through VR Workspaces and Simulation

"VIRTUALITY" (2006-2010)

Project Overview & Objectives

The VIRTUALITY project aimed the development of virtual reality (VR) infrastructure and knowledge on 3D/4D/VR and building information models (BIM) for fully integrated and automated project processes (FIAPP) in construction management. The following constituted the project's prime objectives:

- To upgrade existing CAD-modeling lab facilities and to expand on scientific knowledge on 3D/4D/VR modeling,
- To integrate and automate processes in architectural and engineering design and construction,
- To develop fully integrated and automated processes for the management of construction,
- To enhance the theoretical and applied capabilities of local design/construction institutions and to improve the sustainability of design/constructed facilities,
- To facilitate knowledge transfer between academic and professional institutions and to migrate knowledge from other research projects successfully completed by the Principal Investigators to local practices,
- To develop academic material and case studies for instruction in university-level undergraduate and graduate courses.

Consortium Partners

- University of Cyprus

Project Budget

- 145,200 euro

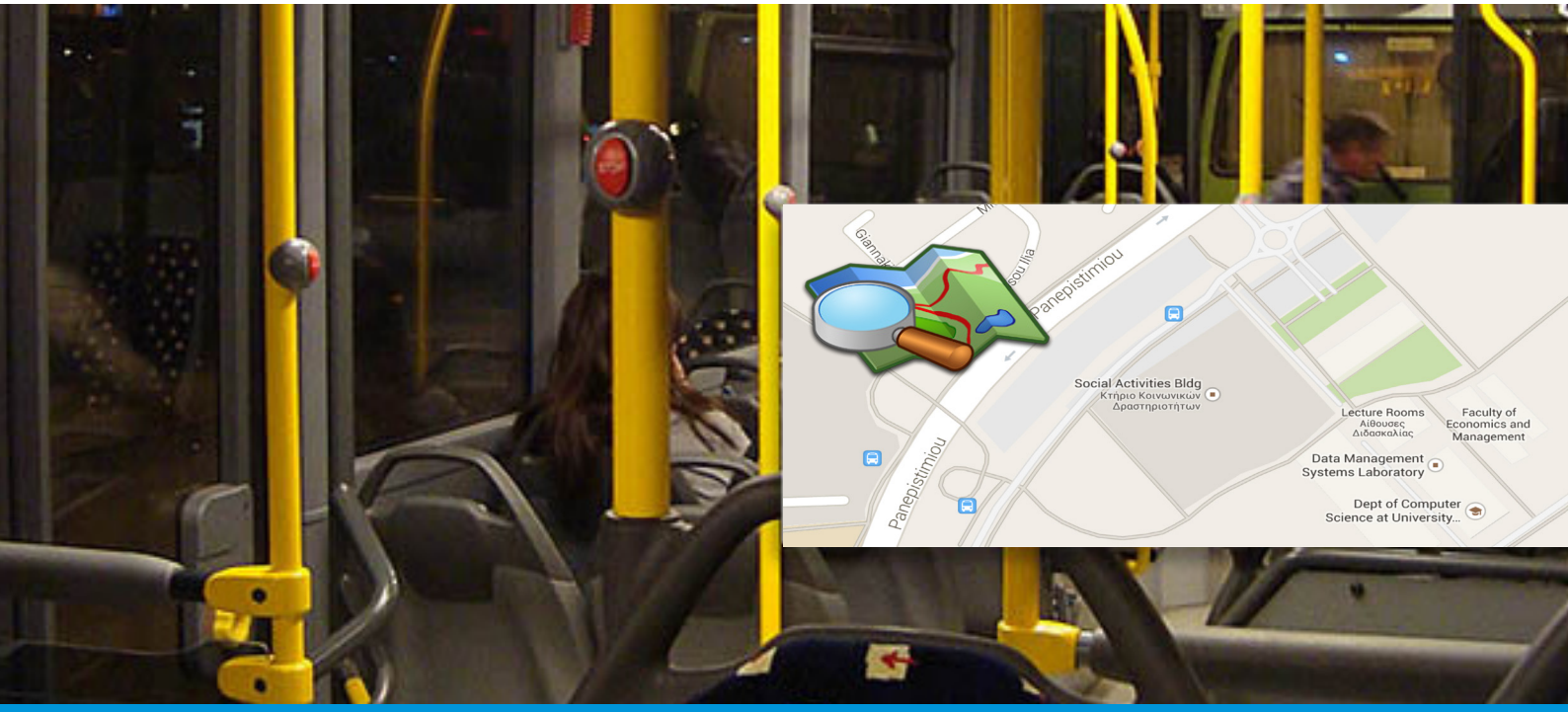
Funding Agency

The VIRTUALITY research project was funded by the Cyprus Research Promotion Foundation through the 2006 National Research Call, under Grant ERYAN/0506/09.

> The notion of virtual reality makes sense only if the 'virtual' half complements the 'reality' half of it, in creative and constructive ways.
>
> The VIRTUALITY research team (2008).

Bus Routing Optimization

“BUS” (2008)



> What’s the point of mass transit, if not accompanied with increased time, cost and energy efficiency and with reduced entropy?
>
> The BUS research team (2008).

Project Overview & Objectives

The project investigated the transportation movements and the daily class schedules of the University of Cyprus’s student population, for the purpose of devising and optimizing bus routes for the University, primarily through the use of geospatial systems and entropy models.

Among the project’s primary objectives were the following:

- Development of integrated relational database system for archiving UCY’s student population and class schedules,
- Development of origin-destination matrices for each student,
- Development of traffic models,
- Appraisal of traffic impacts due to the daily/hourly student movements, by use of entropy models,
- Geospatial mapping spatio-temporal analysis,
- Bus-routing optimization to increase efficiency and to minimize traffic impacts due to the student daily/hourly movements.

Consortium Partners

- University of Cyprus

Project Budget

- 6,850 euro

Funding Agency

The BUS research project was partially funded by the University of Cyprus.

University of Cyprus

UWDN Modeling, Simulation and Optimization of Leakage Detection Via Sensing Technologies

"UCyMSAD" (2009-2012)

Project Overview & Objectives

Cyprus, due to its geographical position and morphology (island) is among the countries that face serious water shortages. Among the most important aspects of addressing the problem of water shortage is the better management of urban water distribution networks (UWDN) so as to reduce water losses.

The UCyMSAD project aimed at:

- The creation of a mathematical model to address pipeline 'repair-or-replace' decisions and prioritize work in UWDN based on risk-of-failure and financial parameters, through the use of a variety of tools (statistical analysis, survival analysis), artificial neural networks, fuzzy logic, graph theory, and life cycle costing),
- The correlation between intermittent water supply and subsequent leakage,
- The use of an integrated wireless sensor network (WSN) for early leakage detection, through a real-life pilot implementation,
- The development of related software based on Geographic Information System (GIS) and database management systems, to be used as a tool for analyzing information related to water supply networks in Cyprus.

Consortium Partners

- University of Cyprus

Project Budget

90,000 euro

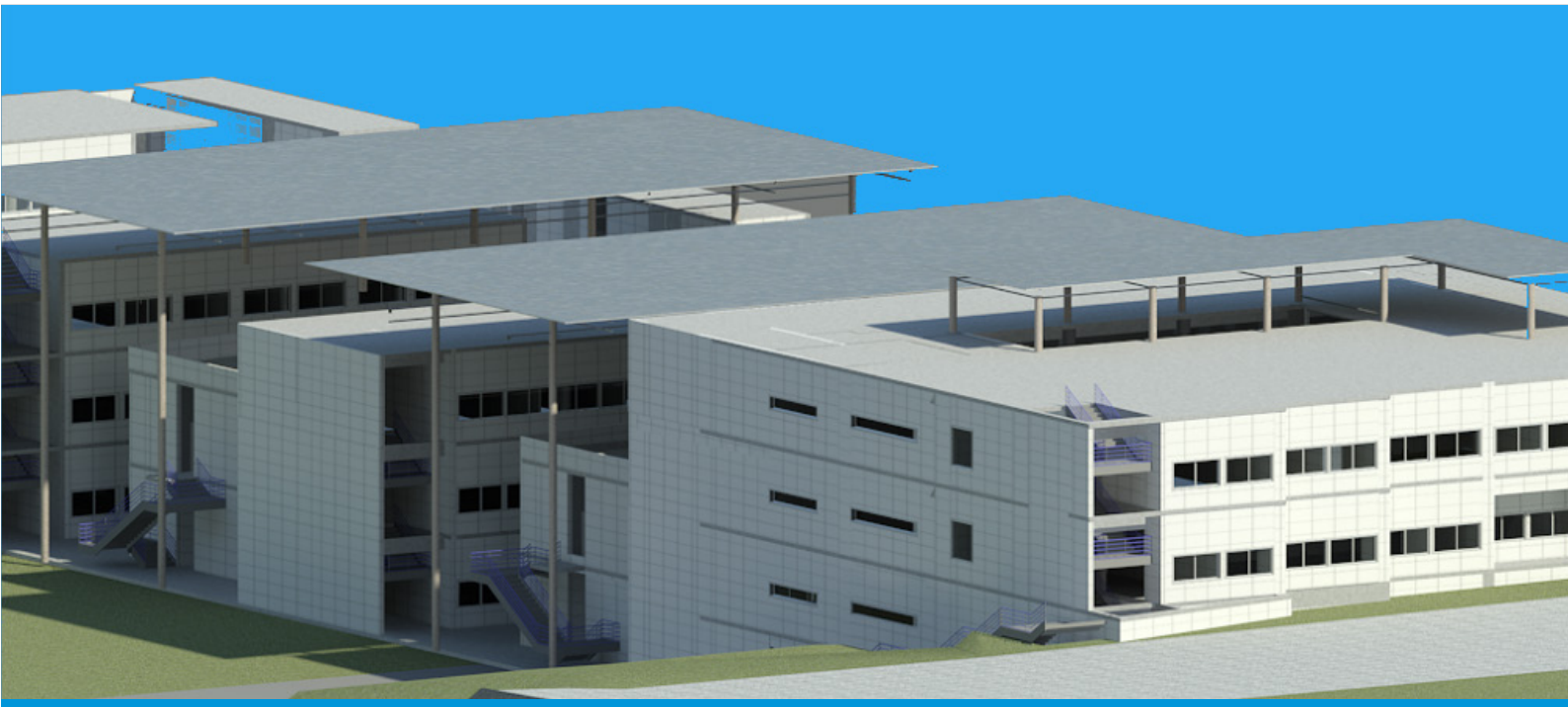
Funding Agency

The UCyMSAD research project was funded by the Republic of Cyprus and the European Union's Regional Structural Funds, through the Cyprus Research Promotion Foundation, under the 2008 National Research Call (Grant PENEK/ENISH/0308/34).

> In order to be able to monitor a UWDN for localization and quantification of leaks, parameters such as water flow, pressure, soil moisture and acoustic noise should be collected directly from sensors embedded in strategic locations within the network.
>
> The MSAD research team (2011).

Automated Generation of Building Information Models (BIM)

"BIMAutoGen" (2010-2014)



> The process of automating the generation of parametric models, in terms of their spatial and visual features, starts by sensing the real world structure and ends with a BIM.
>
> The BIMAutoGen research team (2010).

Project Overview & Objectives

IRSES's objective is to facilitate synergies among international partners and to validate the hypothesis that the proposed novel framework can be successfully used to generate parametric building models almost entirely automatically. IRSES's most significant contributions will be, not only the automation of several mundane and repetitive processes with the addition of visual and spatial pattern recognition in the modelling workflow, but also the exchange of knowledge and the building of transatlantic research collaborations on cutting-edge projects through the exchange of interdisciplinary staff among partners and joint training of researchers on areas of common interest.

Consortium Partners

- University of Cyprus
- Cambridge University (UK)
- Technion Israel Institute of Technology (Israel)
- Foundation for Research & Technology (Greece)
- Georgia Institute of Technology (USA)
- University of Michigan (USA)

Project Budget

334,800 euro

Funding Agency

IRSES is funded under the Seventh Framework Programme (FP7-PEOPLE-2009-IRSES Marie Curie International Research Staff Exchange Scheme).

Ad-Hoc Wireless Sensor Networks for Automatic Meter Reading & Vulnerability Assessment of Water Piping Networks

"UCyAMR" (2010-2012)

Project Overview & Objectives

One of the main issues in mitigating the effects of pipeline failures is the identification of the pipes' vulnerabilities in advance and the implementation of suitable rehabilitation and prevention procedures. Furthermore, the 'online' measuring of water consumption would allow Water Boards to dynamically monitor the water balance in the networks, to detect water losses as they occur, implement 'virtual water' and water-pricing policies based on consumption, and enforce water saving measures devised on volumetric consumption, water quota, and online monitoring. The UCyAMR research project aims at:

- Development of automatic meter reading (AMR) technology (hardware & software) for remote data acquisition,
- Development of GIS-based 'repair-or-replace' DSS for the management of UWDN,
- Pilot implementation of the developed technology.

Consortium Partners

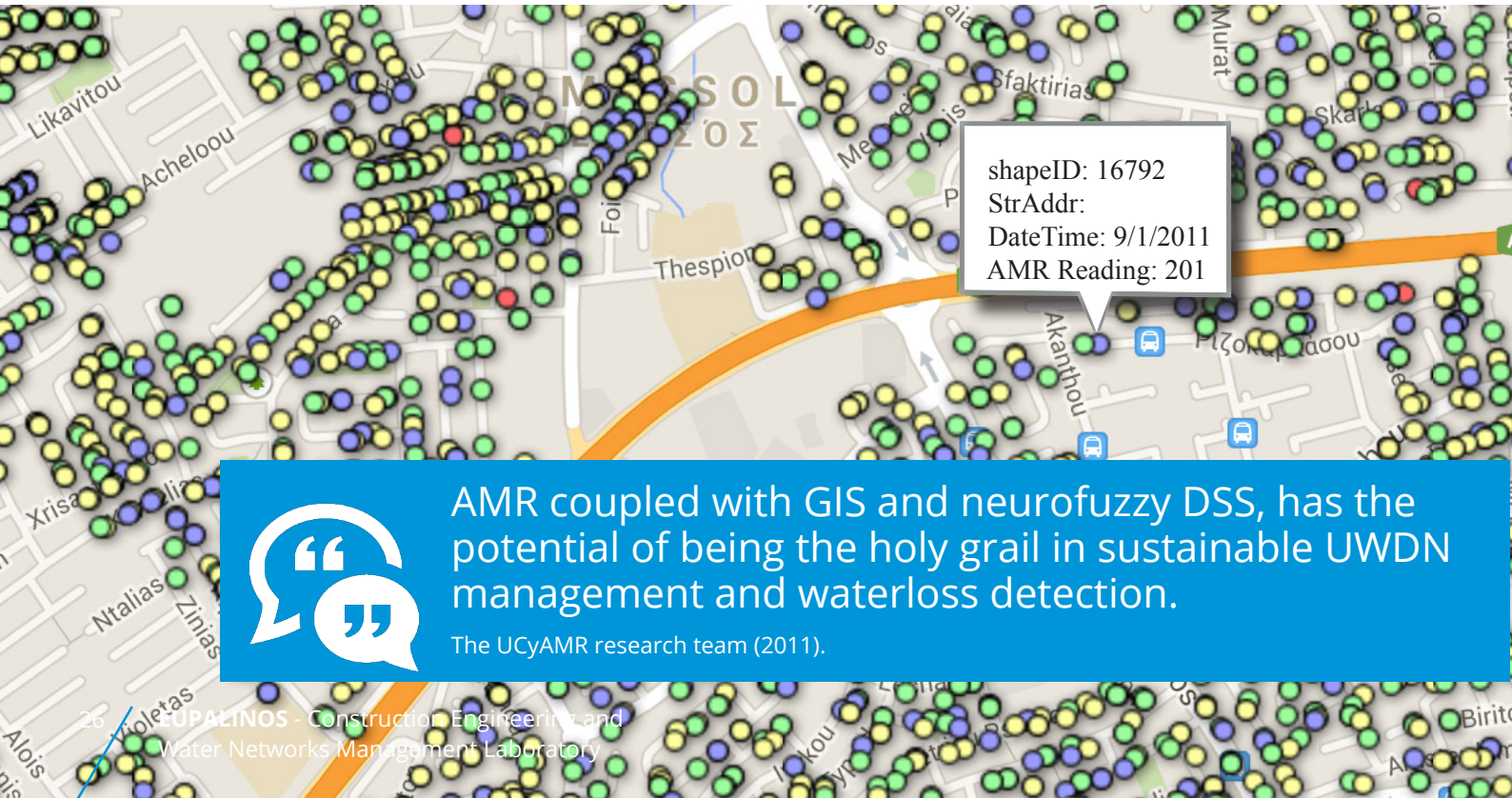
- University of Cyprus
- SignalGenerix Ltd. (Cyprus)
- FWS Ltd. (Cyprus)

Project Budget

- 160,000 euro

Funding Agency

The UCyAMR research project is co-funded by the European Regional Development Fund and the Republic of Cyprus, thru the Cyprus Research Promotion Foundation (DESMI 2008, Grant AEIFORIA/ASTI/0609(BIE)/07).



> AMR coupled with GIS and neurofuzzy DSS, has the potential of being the holy grail in sustainable UWDN management and waterloss detection.
>
> The UCyAMR research team (2011).

Nireas International Water Research Center

"NIREAS-IWRC" (2010-2014)

> Our objective is to conduct research of high international caliber while at the same time serving the research needs of the Cypriot society, economy and industry.
>
> The NIREAS-IWRC research team (2011).

Project Overview & Objectives

Nireas-IWRC is among the first research centers to be created in Cyprus, and its activities include interdisciplinary research aiming at the solution of complex scientific and engineering problems under the unifying theme of water management. The goal is to develop expertise that will enable an integrated approach to this important issue, coupling chemistry, hydrology, geohydrology, hydraulics, advanced modeling capabilities, experimental/analytical work, computational mechanics, risk assessment, environmental science and economics in order to face various emerging problems in this field. The Center focuses on 3 research pillars:

- Water quality, monitoring and treatment
- Water supply and urban water management
- Socioeconomic analysis for water-related issues

Consortium Partners

- University of Cyprus
- University of Cincinnati (USA)

Project Budget

- 1,930,000 euro

Funding Agency

The NIREAS-IWRC research project is co-funded by the European Regional Development Fund and the Republic of Cyprus, thru the Cyprus Research Promotion Foundation (DESMI 2008).

Intelligent Services for Energy-Efficient Design and Life-Cycle Simulation

"ISES" (2013-2014)

Project Overview & Objectives

ISES will develop ICT building blocks to integrate and complement existing tools for design and operation management into a Virtual Energy Lab capable of evaluating, simulating and optimizing the energy efficiency of facilities, taking into account their stochastic life-cycle nature. A holistic approach will be applied to enable efficient use of today's loosely connected numerical analysis tools, modelers and graphical tools, and new stochastic methods will be developed to deal with the random nature of energy profiles and consumption. ISES focuses on the following, among others, RTD issues:

- Interoperability between energy analysis and building design tools, and between product design (STEP) and building design tools (BIM),
- Energy profiles and consumption patterns for building facilities and components that are not yet adequately represented for stochastic treatments and that are not generic enough,
- Configurators for combining energy profiles for stochastic life-cycle analysis.

Consortium Partners

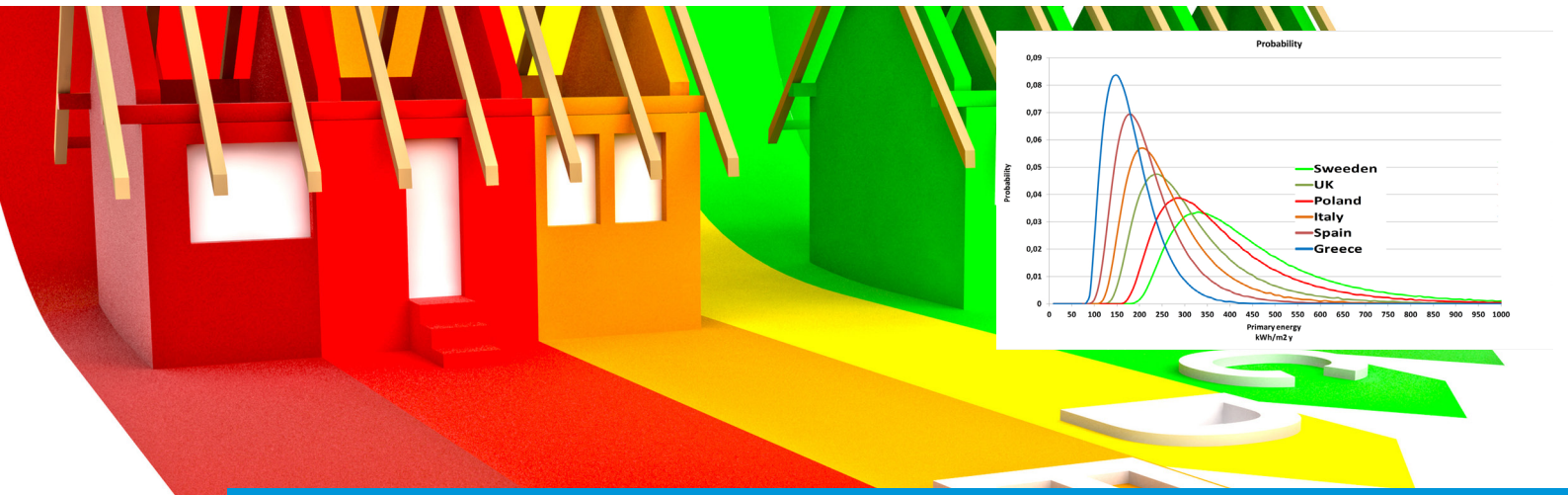
Technische Universität Dresden (Germany); Granlund Oy (Finland); Univ. of Ljubljana (Slovenia); SOFiSTiK Hellas S.A. (Greece); Nyskopunarmidstod Islands (Iceland); National Observatory of Athens (Greece); Leonhardt, Andrä und Partner (Germany); Trimo d.d. (Slovenia); Russian Academy of Sciences – Institute for System Programming (Russia); Univ. of Cyprus (Cyprus).

Project Budget

- 4,410,000 euro

Funding Agency

The ISES research project was funded by EU's 7th Framework Programme (ICT systems for Energy Efficiency, ICT-2011.6.2) under Grant No. FP7-ICT-2011-7/288819.



> The goal of the project is to increase, by an order of magnitude, the quality of energy-efficiency in design through the development of an In-Silico Energy Simulator Laboratory.
>
> The ISES research team (2013).

Integrated Platform for Security and Safety in Intelligent Multi-Modal Transport

“PRODROMOS” (2013-2015)

> The maritime sector is called upon to adopt innovative and technologically advanced applications for the management of ports and for the safe transport of goods and people across the entire travel chain.
>
> The PRODROMOS research team (2014).

Project Overview & Objectives

The project’s main objective is the integration of best practices, existing operations and studies into a single methodology for intelligent marine transport, and to improve safety, efficiency and quality of services related to the supply and distribution chains through seaports. Further, the project aims the creation of the first cross-border ITS for trafficking through seaports and for the safe transport of dangerous cargo (from ports to final destination via the national road networks).

Consortium Partners

- Ministry of Communications and Works - Dept. of Public Works (Cyprus)
- University of Cyprus
- Cyprus Ports Authority
- Ministry of Infrastructure, Transport and Networks (Greece)
- Heraklion Port Authority S.A. (Greece)
- Foundation for Research and Technology (Greece)

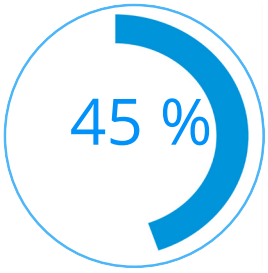
Project Budget

- 1,900,000 euro

Funding Agency

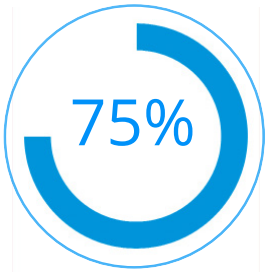
The PRODROMOS research project is co-funded by the European Union, Greece and Cyprus, under Grant No. K5/03/01.

Infographics



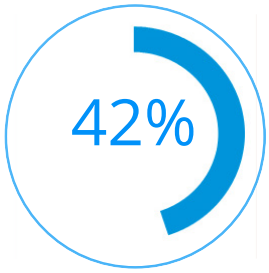
1

Funding through international competitive grants (not including projects managed by CyRPF).



2

High utilization of graduate students and post-doctoral research associates.



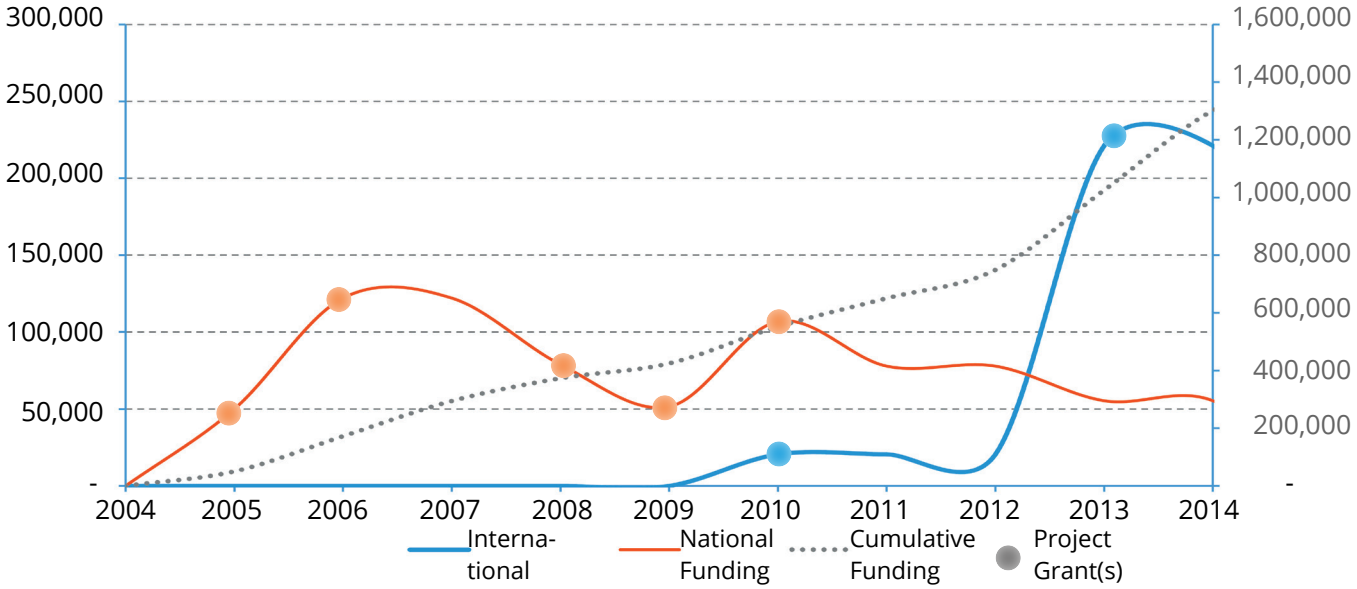
3

An equal-opportunity research lab, with a balanced utilization of female research staff.

8,929,484 €
Total budgets of the projects EUPALINOS participated in.

4,519,484 €
Total budgets of the projects EUPALINOS acted as PI or Co-PI.

1,445,194 €
Total direct funding for the EUPALINOS Lab.



4

Cashflows based on the research grants assigned to the EUPALINOS Lab (through national and international funding sources).

Funding Sources (EUPALINOS's Budgets)	
Cyprus Research Promotion Foundation (CyRPF)	514,400
European Regional Development Fund (through CyRPF)	276,800
EU's FP7 (IRSES) Program	102,600
EU's FP7 (ICT) Program	114,560
Interreg	430,000
University of Cyprus	6,834

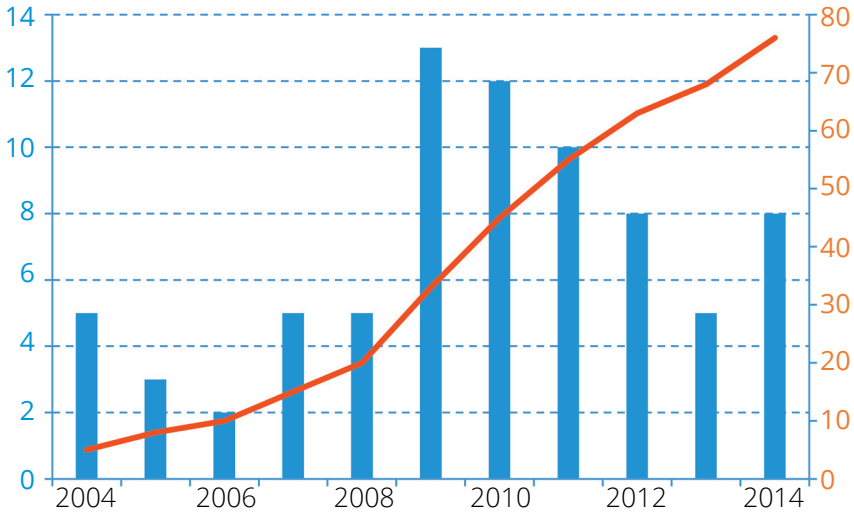
Funded Research Projects	Total Budget	EUPALINOS Budget
EDRISYS (2005-2007)	215,017	145,000
BUS (2008)	6,835	6,835
EDRISENSE (2006-2008)	223,536	129,168
MSAD (2009-2012)	90,000	90,000
VIRTUALITY (2006-2010)	145,231	145,231
UCyAMR (2010-2012)	204,120	56,800
BIMAutoGen (2010-2014)	334,800	102,600
Nireas-IWRC (2010-2014)	1,399,945	220,000
ISES (2013-2014)	4,410,000	114,560
PRODROMOS (2013-2015)	1,900,000	430,000

A STRATEGY SHIFT

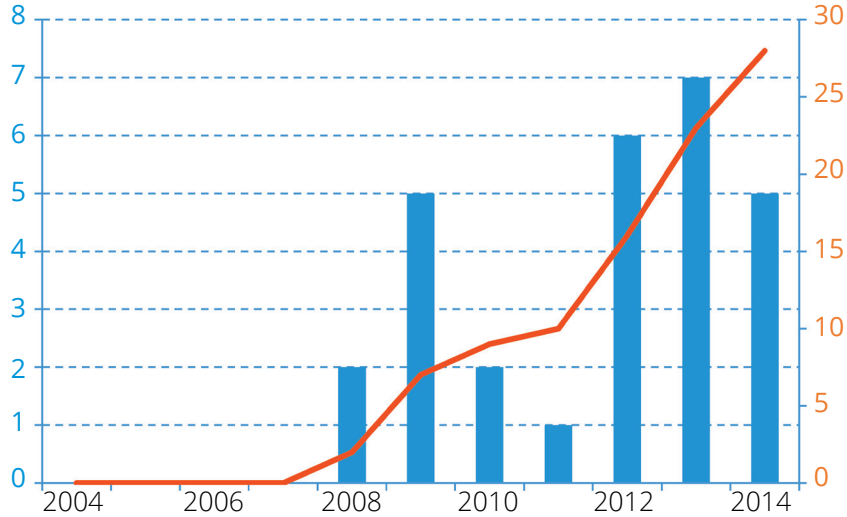
Year 2011 was a turning point for the EUPALINOS Lab, as the national research calls went on a hiatus (2011-2014) and the EUPALINOS team turned its attention to international research calls. The results were extremely rewarding.

647,160 €

EUPALINOS's research budgets (2010-2014), through international research grants.



Annual and total publication output
(journal and conference publications)



Graduate theses
(PhD, MSc and MEng level)

Research Team

What started in 2004 as a painful quest to recruit graduate students, phd candidates and/or research associates to work on research ideas pertaining to construction engineering & management and on other contemporary research topics, has since then snowballed into what we now refer to as the "**EUPALINOS - Construction Engineering and Water Distribution Networks Management Laboratory**" with about 10 researchers currently affiliated to the Lab, and employed either through externally funded projects or their academic programs (PhD candidates, MSc/MEng students).

Currently, the EUPALINOS Lab employs 2 postdoctoral fellows, 3 phd candidates, 3 research associates, and 3 MSc/MEng students, while also managing several other MSc/MEng students working on their graduate theses.

2006

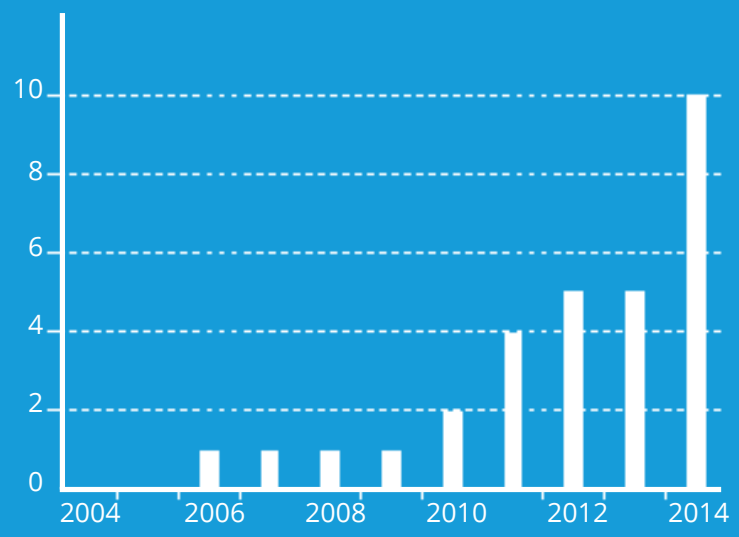
In the first years of its operation, the research group of EUPALINOS consisted of only PhD candidate, funded through an external research grant (from the Cyprus Research Promotion Foundation).

2010

Year 2010 was a turning point for EUPALINOS, as a number of research grants enabled us to recruit several research associates.

2014

Currently, 4 EU-funded research projects of approximately 700K euro in direct funding for EUPALINOS, enable us a core of 10 funded researchers.



Further to the funded researchers, the EUPALINOS team employs a number of graduate students who compliment our efforts through research for their academic theses. Currently (Year 2014), the Lab houses the research efforts of one MEng and three MSc students, as well as of one visiting scholar.

Current Research Team

(Year 2014)

Dr. Savvas Xanthos
Senior Researcher, Fullbright Scholar

Dr. Xanthos has a background in Mechanical Eng., with specialization in experimental fluid mechanics (PhD 2004, City University, USA). His research has been in Fluid Mechanics with applications in the engineering and biomedical fields. Dr. Xanthos has recently completed a one-year research placement at the University of Cyprus on a Fullbright Scholarship, and he is currently employed at the EUPALINOS Lab on two externally-funded projects related to water distribution networks (Nireas-IWRC) and building energy efficiency (ISES).

Dr. Charalambos Georgiou
Post-Doctoral Associate

Dr. Georgiou has studied at UCy's Department of Civil and Environmental Engineering (BSc, 2007; MSc, 2009; PhD, 2013). He specializes in Building Information Modeling, and in integrated damage assessment for post-earthquake reinforced concrete building rehabilitation. Since Dec. 2013 he has been a Research Associate of EUPALINOS, employed on an externally-funded project related to building energy efficiency (ISES), while also serving as an Energy Officer at the Cyprus Institute of Energy.

Mr. Agathoklis Agathokleous
Doctoral Candidate

Agathoklis is a graduate of the Higher Technical Institute in Cyprus, the University of Surrey (UK, BEng) and the University of Cyprus (MSc Civil Engineering, 2008). His research work has been on risk analysis, decision support systems and sensor development for the sustainable management of urban water distribution networks. He has worked on a number of related externally-funded projects by the Cyprus Research Promotion Foundation (UCyEDRISENSE, UCyMSAD, UCyAMR) and has published extensively on his research work.

Mr. Charalambos Kyriakou
Doctoral Student

Charalambos holds a BSc degree in Civil and Environmental Engineering from the University of Cyprus (2009) and a MSc degree in Construction Project Management at the University of Manchester (2010). Upon completion of his studies, he worked for 2 years as a site and structural engineer in the public and private sectors. He is currently a full-time PhD candidate in Civil Engineering at the University of Cyprus, while also employed as a Research Associate on the "PRODROMOS" research project.

Mr. Georgios Hadjidemetriou
Doctoral Student

Georgios holds a MEng in Civil Engineering from the National Technical University of Athens. He has also completed a MSc in Project and Enterprise Management at University College London. He has gained work experience as a trainee in construction companies in Cyprus. He is a PhD candidate and his research focuses on Building Information Models.

EUPALINOS's most-valued asset is nothing else but its people!

Ms. Sofia Kranioti
Researcher

Sofia holds a BEng in Electrical Engineering and an MBA, both from the Aristotle University of Thessaloniki (Greece), and specializes in software development. She has been working for the EUPALINOS Lab on a number of externally-funded projects, on topics related to urban water distribution networks and sensor development (UCyAMR), BIM-based energy efficiency of buildings (ISES), and intelligent multimodal transport (PRODROMOS).

Ms. Eleni Toxqui
Researcher

Eleni holds BSc (City University of New York) and MSc degrees (NYU Polytechnic) in Civil Engineering. Upon her graduation she joined STV, a leading U.S. civil engineering firm, as a project controls engineer on several U.S. projects. She is currently serving as a project manager for NIREAS-IWRC and as a Research Associate on two externally funded projects, related to intelligent multimodal transport (PRODROMOS) and building energy efficiency (ISES).

Mr. Anastasis Gagatsis
Researcher

Anastasis is an environmental scientist, GIS and data analyst, with a BSc in Environmental Sciences (Univ. of York, UK) and a MSc in GIS (Univ. of Edinburgh, UK). He has been with the EUPALINOS research group since 2011, working on the degradation of water distribution networks and since 2013 on the PRODROMOS project, with a focus on designing and applying solutions for tracking inland movements of dangerous cargo trafficking through seaports.

Ms. Pantelitsa Mavrovounioti
Researcher

Pantelitsa holds a BA degree in computer science from the University of Nicosia (2013), specializing in software development and digital projects. She has experience working on high-demand university projects and is currently working on the "BIMAutoGen" research project.

Note to selves: When it comes to raising productivity[1], nothing beats a good break over drinks.

([1] the term 'productivity' is, herein, used loosely)

Mr. Andreas Chari
MSc Student

Andreas is currently in the last phase of his MSc degree studies in civil engineering, having also graduated from the University of Cyprus's Department of Civil and Environmental Engineering with a BSc degree (2013). Andreas's research thesis is focused on the stochastics of building energy calculations, closely working with colleagues on the ISES project (an EU-funded FP7 program in which the EUPALINOS Lab was a consortium partner).

Ms. Elena Kourti
MSc Student

Elena has recently joined the University of Cyprus's graduate program in pursuit of a degree (MSc) in civil engineering, having also received from UCY a BSc degree in civil and environmental engineering (2014). Elena's research interests are in the areas of transportation and of building information models.

Ms. Christina Christodoulou
MSc Student

Christina is a graduate of the University of Cyprus with a BSc degree in civil and environmental engineering (2014). She is currently in the graduate program in civil engineering, with research interests in building information models and sustainable built environment.

Ms. Erato Panayiotou
Visiting Scholar

Erato is a graduate of the University of Edinburgh, with a BSc honors degree in ecological and environmental sciences (2011-2014). In the summer of 2014, she joined Nireas-IWRC and the EUPALINOS Lab for work on urban water distribution networks, performing a number of statistical and pattern recognition studies pertaining to waterloss management.

Kristopher and Nikolas
Perspective Engineers

... and the official "EUPALINOS Lab Mascots".

PhD/MSc/MEng Theses

PhD level

- Agathokleous, A. (2014). Sustainable management of urban water distribution networks via real-time monitoring and survival analysis modeling.
- Georgiou, C. (2013). Damage assessment, repair scheduling and visualization for post-earthquake building rehabilitation.
- Michaelidou-Kamenou, A. (2010). A unified entropy theory for the management of construction.

MSc Level

- Chari, A. (2014). BIM-based building energy efficiency and risk analysis.
- Christoforou, C. (2014). A GIS-based decision support system for roadway condition assessment and prioritization of works in roadway networks.
- Gartzonikas, C. (2014). Entropy-based impact assessment of roadway closures for optimizing the operations and maintenance of roadway networks.
- Menoikiotou, M. (2012). Analysis and productivity improvements in roadway operations using Stroboscope Simulator.
- Koukoutsaki, A. (2012). Spatial modeling and social interaction simulation for energy-efficiency studies.
- Georgiou, C. (2009). Damage assessment, repair scheduling and visualization for post-earthquake building rehabilitation.
- Hadjikleanthous, K. (2009). FIAPP for public works: the case of Larnaca's International Airport.

MEng Level

- Christou, D. (2014). Construction contracts and appraisal of construction claims.
- Rossou, A. (2013). The effects of Cyprus's financial crisis on the construction sector.
- Kourtellou, D. (2013). GIS-based traffic load analysis of UCy's student body.
- Thrasyvoulou, A. (2013). Roadway operations and maintenance optimization.
- Kanellides, L. (2013). BIM-based quantity takeoff Case study: UCy's School of Engineering.
- Giorkas, G. (2013). BIM-based cost estimation - Case study: UCy's School of Engineering.
- Konatzi, A. (2013). BIM-based scheduling - Case study: UCy's School of Engineering.
- Neophytou, N. (2012). UCY's School of Engineering - Project planning and risk analysis.
- Liasidis, P. (2012). Santa Barbara Hills Park - Project planning and risk analysis.
- Aniftos, M. (2012). GIS-based risk assessment for forestry fires.
- Alexoglou, V. (2012). Construction claims and Cyprus's legal system.
- Christodoulou, S. (2011). Cyprus's legal framework for construction contracts.
- Karamanis, M. (2010). FIAPP-based system for competitive bidding.
- Papadopoulou, C. (2009). GIS-based optimization of leak-detection sensor placement.
- Georgiou, A. (2009). Review of Cyprus's legal framework on construction claims.
- Michael, E. (2009). Mitigation measures for construction claims in public works.
- Michael, M. (2008). Design and management of urban wastewater distribution networks.
- Hadjichristou, E. (2008). GIS-based vulnerability assessment of Larnaca's wastewater distribution network.

Outreach Activities

Our scientific and social mission wouldn't be complete without dissemination and outreach activities, beyond the typical scientific publications and conference presentations.

In fact we have taken a very active role in disseminating the Lab's activities and in communicating our work to not only the scientific community but also the public, via a variety of outreach activities.

2004-2014

Noteworthy, among many, are the following activities:

- articles in national and local press,
- interviews on national tv and radio stations on contemporary topics of our expertise,
- scientific talks at high schools and mentoring to high school students,
- competition judging at the national Stockholm Junior Water Prize Competition,
- participation at “Researchers’ Night” events, hosted by the Cyprus Research Promotion Foundation,
- fund-raising for the Karaiskakio Foundation, though the ‘Head Shave Challenge’ event,
- talks and workshops for the Technical Chamber of Cyprus,
- participation in national experts committees and issuancee of public-service reports,
- hosting of visiting scholars (e.g. Fulbright scholars from the USA),
- dissemination through the Lab’s website and on social media.

University of Cyprus

nireas International Water Research Center

eupalinos Construction Engineering and Water Networks Management Laboratory

EUPALINOS

Construction Engineering and Water Networks Management Laboratory

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