



## EWARD

### Energy and Resource Awareness in Urban and Regional Development Doctoral College at the Vienna University of Technology - VUT Energiebewusste Stadt- und Regionalentwicklung

With this call, the Vienna University of Technology is announcing a Doctoral College for

- 10 doctoral positions under specific supervision of professors from the Faculty of Architecture and Planning as well as the larger scientific community
- Ph.D. courses on relevant topics during the course of studies

Each position is financed at a basic level by the Vienna University of Technology VUT; the monthly income amounts to 945,45 € (gross before taxes, 14 times per year, based on a contract as doctoral candidate, "Prae-Doc", according to the "Kollektivvertrag der österreichischen Universitäten", job class B1, 15 hours per week).

Additional employment for the PhD candidates may be provided via involvement in other research projects depending on the resources of the respective projects. If applicable, candidates are expected to actively participate in research projects funded within the framework of programmes such as "Mobility of the Future", "City of the Future", and others, is expected from candidates.

#### Details for application

This doctoral college explicitly encourages applications by women candidates.

Period of application: from 6<sup>th</sup> until 25<sup>th</sup> of November, 2013.

Please, indicate the number of the position (see Table below) for which you are applying.

Applications have to be sent to:

Personaladministration, Fachbereich wissenschaftliches Personal der TU Wien,  
Karlsplatz 13, 1040 Wien by mail, or to  
[ildiko.haidenschuster@tuwien.ac.at](mailto:ildiko.haidenschuster@tuwien.ac.at) by email.

Besides, please send your application also to the respective principal supervisor by email as indicated below.

#### Overview of key fields and questions (Ph.D. topics and positions) of EWARD

	Doctoral Position / Topic	Principal supervisor
(1)	Infrastructure economics and policy, and sustainable resource consumption: Modelling and overcoming the unsustainable "lock-in"	Michael Getzner <a href="mailto:michael.getzner@tuwien.ac.at">michael.getzner@tuwien.ac.at</a>
(2)	Urban and regional planning and renewable energies – strategic challenges, potentials, tools and implementation	Sibylla Zech <a href="mailto:sibylla.zech@tuwien.ac.at">sibylla.zech@tuwien.ac.at</a>
(3)	Low-carbon strategies in urban and regional planning – challenges, needs, potentials, tools and implementation	Sibylla Zech <a href="mailto:sibylla.zech@tuwien.ac.at">sibylla.zech@tuwien.ac.at</a>
(4)	Smart City as a socio-technical innovative process	Rudolf Giffinger <a href="mailto:rudolf.giffinger@tuwien.ac.at">rudolf.giffinger@tuwien.ac.at</a>
(5)	Strategic Planning of energy efficient Smart Cities and Regions	Rudolf Giffinger <a href="mailto:rudolf.giffinger@tuwien.ac.at">rudolf.giffinger@tuwien.ac.at</a>
(6)	Social behaviour in the fields of energy consumption and mobility	Jens S. Dangschat <a href="mailto:jens.dangschat@tuwien.ac.at">jens.dangschat@tuwien.ac.at</a>



(7)	Strategic spatial concepts for an energy-conscious infill development of settlements	Andreas Voigt <a href="mailto:andreas.voigt@tuwien.ac.at">andreas.voigt@tuwien.ac.at</a>
(8)	Model-based computational decision support for large-scale energy efficiency measures in the built urban environment	Ardeshir Mahdavi <a href="mailto:ardeshir.mahdavi@tuwien.ac.at">ardeshir.mahdavi@tuwien.ac.at</a>
(9)	Promoting the integration of energy and mobility policies through governance structures and processes	ISRA, to be confirmed <a href="mailto:jens.dangschat@tuwien.ac.at">jens.dangschat@tuwien.ac.at</a>
(10)	Mobility Management in the Smart City Context	Martin Berger, to be confirmed <a href="mailto:michael.getzner@tuwien.ac.at">michael.getzner@tuwien.ac.at</a>

## Short description of doctoral positions and qualifications of candidates

### ***(1) Infrastructure economics and policy, and sustainable resource consumption: Modelling and overcoming the unsustainable “lock-in”***

Topic, field of research:

- Development of an economic model of decision makers (companies, private households, public sector, energy sector) with respect to energy infrastructure, the lock-in, and possibilities to implement new technologies (e.g. decentralized, renewable resources; smart grids);
- Presentation of future scenarios depending on the model and projections of the energy mix, consumption, and production, including costs of new or adapted networks;
- Planning tool for infrastructure networks, including technical constraints, partial interests of stakeholders, new technologies, and normative policy frameworks.

Qualifications:

- Education in economics or environmental sciences or planning (or similar), with technical (mathematical) and modelling skills;
- Interest in infrastructure economics (e.g., networks, lock-in, new technologies, pricing)
- Energy policy and climate change experience or focus/interest in the previous study program(s);
- Knowledge of statistical software is a plus.

The concrete methodology and research questions of the Ph.D. work are not yet fixed; candidates may propose a methodology (e.g., classical economic models of behavior; system dynamics); purely theoretical work is not the focus of the topic.

### ***(2) Urban and regional planning and renewable energies –strategic challenges, potentials, tools and implementation***

Topic, field of research:

- Spatial requirements, needs and impacts of renewables (e.g. direct and indirect land consumption, location criteria, land use synergies and conflicts)
- Planning tools for implementing renewable energies in urban and regional planning (e.g. land use zoning)
- Strategies for land use management to secure the energy supply and to raise the renewable production
- Steering concepts on different spatial and cooperation levels to support energy efficient spatial structures, mapping stakeholders and actors to create and develop spatial energy planning.



Qualifications:

- Master degree in urban and regional planning or comparable university degree
- Scientific experience and expert knowledge on urban and regional development as well as practical planning experience, particularly in regard to conserve and manage natural resources and energy
- Professional qualifications and / or additional trainings on energy-related consultancy

The concrete focus and methodology of the Ph.D. work is not yet fixed; candidates may propose main emphases and methodology; purely theoretical work is not the focus of the topic, the results shall be thoroughly researched and professionally grounded tools for implementing renewable energies in urban and regional planning and development.

***(3) Low-carbon strategies in urban and regional planning – challenges, needs, potentials, tools and implementation***

Topic, field of research:

- Thinkings and visions about the future of cities and regions beyond petroleum: spatial structures, development dynamics and life patterns in cities, agglomerations and regions and their consequences (low-carbon and post-petroleum spatial visions and scenarios, global, national, regional and local effects)
- Low-carbon strategies within the context of climate change – energy – urban metabolism and spatial planning in different environments, driving forces
- Requirements in spatial planning to address low-carbon urban and regional land use development and management
- Development, implementation and evaluation of strategies and measures, policy recommendations

Qualifications:

- Master degree in urban and regional planning or comparable university degree
- Qualifications in designing visions and scenarios, experience and skills in visualization
- High interest on low-carbon spatial policies and approaches

The concrete focus and methodology of the Ph.D. work is not yet fixed; candidates may propose main emphases and methodology; purely theoretical work is not the focus of the topic, the results shall be thoroughly researched and professionally grounded tools for implementing low-carbon strategies and measures in urban and regional planning and development.

***(4) Smart City as a socio-technical innovative process***

Topic, field of research:

- Theoretical discussion of urban development as socio-technical system
- Identification and meaning of social and technical innovations for energy efficient urban development
- Analysis of meaning of planning tools (effectiveness, socio-spatial impacts)
- Modeling of the mutual relations between structures (e.g., housing, land use) – technology (e.g., transport, communication conditions) – behavior (specific target groups)
- Elaboration of relevant planning approach (strategic recommendations with respective measures) steering energy efficient urban development and climate protection



Qualifications:

- Education in environmental sciences, geography or planning
- Qualification in analytical systemic thinking, methodology and modeling
- Knowledge and experiences in statistical analysis as well as geo-modeling based on GIS
- High interest (with basic qualification and experiences) in Smart City development with special focus on social and technical innovations as driving forces

The concrete methodology of the Ph.D. work is not yet fixed but predominantly based on theory of urban system; candidates may propose a methodology supporting theoretical discussion and empirical research. However, purely theoretical work is not the focus of the topic.

***(5) Strategic Planning of energy efficient Smart Cities and Regions***

Topic, field of research:

- Theoretical discussion of urbanization, metropolisation and competitiveness considering urban-metropolitan development in an evolutionary perspective
- Methodological discussion/concept integrating externally given challenges and learning based decision making
- Identification of key fields for energy efficient urban development under competitive conditions (drivers, potentials, chances and risks for resilient development)
- Empirical analysis integrating place based evidence and perception/assessment of trends/challenges
- Analysis of recent approaches and relevant planning tools (effectiveness, efficiency, socio-spatial impacts)
- Conceptualization of strategies improving energy efficiency and climate protection and considering urban development as a process of transitions

Qualifications

- Education in urban geography, urban (strategic) planning, environmental sciences
- Qualification in theories of urban development and strategic planning (governance and government) as well as in methodological issues of urban-regional analysis
- Knowledge and experiences in quantitative and qualitative methods of empirical research
- High interest (with basic qualification and experiences) in Smart City development with special focus on energy efficiency, climate protection and strategic planning

The methodology of the Ph.D. work is not yet fixed. However, it is expected to integrate theories of urban and regional development with planning theory as well to deploy mixed-methods (quantitative and qualitative) based on a clear methodological concept.

***(6) Social behavior in the fields of energy consumption and mobility***

Topic, field of research:

- Theoretical discussion of social behaviour and action (structure-action-relations),
- Theoretical discussion of socio-spatial action (space as relational fact),
- Theoretical discussion of social inequalities (what's beyond the theory of stratification?),
- Multivariate statistics (cluster analysis, factorial analysis, correspondence analysis).



Qualifications:

- Education in social sciences (social inequalities, sociology of behaviour, sociology of space),
- Excellent knowledge in quantitative methods,
- Well experienced in empirical research,
- Specialisation either in the analysis of mobility or built environment/settlement structures,
- Interest in modelling.

The topic of the doctoral thesis is not fixed yet and should be developed starting from the interest of the candidate with respect to overlapping with other candidates of the programme and bridging to the qualifications and topics of ISRA.

***(7) Strategic spatial concepts for an energy-conscious infill development of settlements***

**Keywords:** strategic spatial development, infill development, settlement systems, settlement and development structures, energy awareness, spatial modelling and simulation

The key issues for future spatial development – e.g. safeguarding the energy supply for our living environments, securing mobility, the infill development of urban systems, dealing with demographic change and climate change – are complex ones. Proper handling of this complexity is therefore of decisive importance in developing viable potential solutions for spatial planning problems. The reduction of complexity to an acceptable level by means of spatial modelling is the essential basis for a spatial simulation, the aim being to facilitate decision-making, communication and knowledge gain. The development of strategic spatial concepts for energy-conscious infill development of settlement systems on various levels of scale and complexity is regarded as a key element for sustainable future development.

The research work addresses the following aspects and problems, which will form the strategic focus of the thesis:

- References to different spatial and settlement structures, urban form, urban ecology and the economy of the settlement system
- Strategic spatial overviews to identify potentials for infill development, scope for spatial planning and development
- Definition of spatial and functional typologies – set of indicators, development, prioritization and weighting using parametric combinatorics, problem of fuzzy logic in the delimitation of spatial types and spatial development aims
- Multiscale scenario development and option testing
- Differentiation of spatial development aims
- Step-by-step qualification of spatial types and strategic implementation of the spatial concepts

Hence, applicants should have an academic knowledge of multiscale and strategic planning & design (from architectural design to urban planning/ top-down and bottom-up processes). Further, they should have an understanding of the interaction of spatial, technical and social processes linked to simulation and modelling. In this context an understanding and knowledge of digital analytical methods (e.g. Space Syntax, Visibility Graph Analysis) as well as 3D modelling competencies are preferred.

***(8) Model-based computational decision support for large-scale energy efficiency measures in the built urban environment***

Topic, field of research:

- Urban-level building energy modeling
- Morphological and semantic sources of variance in urban micro-climate
- Multi-scale environmental (climatic) context modeling (regional, urban, district)
- Development of computational decision support systems for urban-scale energy efficiency measures



- Hybrid (empirical/computational) assessment of urban-level renewable energy harvesting potential

Qualifications:

- Building science, building performance assessment, energy simulation
- Urban physics, urban micro-climate, urban morphology
- Computer science skills (system modeling, programming)
- GIS and data visualization
- Capability to work within an interdisciplinary international research environment

The Ph.D. work shall deploy a mix-mode methodological approach, involving both empirically-based (data-driven) and analytical (first-principles-based) methods. Moreover, standard system development procedures in software-engineering shall be followed.

***(9) Promoting the integration of energy and mobility policies through governance structures and processes***

Topic, field of research:

- Theoretical reflection on the definition of energy and mobility governance with regard to certain processes and structures of interaction
- Identification of the main characteristics of energy and mobility governance on the local level
- Analysis of governance factors hindering and promoting the integration of energy and mobility policies between tiers of government ('vertical governance')
- Analysis of governance factors hindering and promoting the integration of energy and mobility policies on the urban and regional level ('horizontal governance')
- Development of a multi-level governance model for integrating energy and mobility policies efficiently and legitimately

Qualifications:

- Master degree in sociology, political science or urban and regional planning
- Knowledge in governance theories and governance analysis with regard to environmental, energy or mobility policies
- Knowledge and experiences in qualitative methods of empirical social research

***(10) Mobility Management in the Smart City Context***

Topic, field of research:

- Theoretical discussions: Behavior change theory and ICT-based Mobility Management
- Conceptualization of planning strategies dealing with the integration of mobility, energy and ICT
- Identification of emerging ICT- based Mobility Management concepts for optimizing mobility in Smart Cities
- Identification and application of new technologies for sensing, monitoring and the collection of mobility data
- Empirical analysis of e.g. target groups, user needs, changes in travel behavior
- Data analysis with multivariate statistics (e.g. cluster analysis, logit models)
- Improvement of transport planning models essential to complex decision-making processes
- Assessment of social, ecological and economic impact and benefits of ICT-based Mobility Management



Qualifications:

As our ideal candidate you have:

- Educational background in planning sciences (e.g. transportation, urban) or comparable studies with focus on transportation or travel behavior research
- Scientific interests in transportation planning, mobility management and travel behavior research
- Knowledge in quantitative and qualitative methods of empirical social research
- Technical knowledge in computer aided planning tools like transport planning models and GIS

The topic of the doctoral thesis is not yet defined and should be developed based on the interest of the candidate and with respect to overlapping expertise of other candidates in the program. The topic of the thesis must also match the qualifications and topics of IVS. Importantly, exclusively theoretical research is not the focus of the topic.