

RESEARCH LINE 11A	
COMPANY	Fundación Tatiana Pérez de Guzmán el Bueno
PhD THESIS SUPERVISOR (UPM)	Prof. Dr. José Antonio Manzanera de la Vega <i>Forestry and Natural Resources Engineering School Department of Forest Engineering and Environmental Management</i>
PhD THESIS CO-SUPERVISOR (COMPANY)	Co-Supervisor: Dr. Álvaro Matud Juristo <i>Director of Institutional and Academic Relations Fundación Tatiana Pérez de Guzmán el Bueno</i> Tutor: Mr. Jesús Zamora Rodríguez <i>Director of Projects and Investments Fundación Tatiana Pérez de Guzmán el Bueno</i>
DESCRIPTION OF THE PhD THESIS PROJECT	<p>Title of the proposed Doctoral Thesis: Urban and Periurban Green Infrastructures as an ecosystem service of health and biodiversity.</p> <p><u>State of the art</u></p> <p>Humanity is part of nature, its common home. However, in its historical development, it has evolved towards lifestyles in which the tendency has been to achieve greater autonomy with respect to the natural environment, constituting urban societies, and sometimes large metropolises. This trend has led to the loss of direct contact with the natural environment, which is still essential for the proper development of the human person. To solve or alleviate this problem, urban centers have created green areas, as a contribution to the welfare of the population, thinking of their needs. But this relationship can also be analyzed from the side of nature, as the contribution that man makes to the conservation of ecosystems, and especially biodiversity. In this way, green areas are transformed into the concept of GREEN INFRASTRUCTURES, forming part of a network of spaces and areas that connect the city with places that are unaltered or little altered and that contribute to the conservation of biodiversity. With them, human activities are integrated into a natural or semi-natural environment, and parks and gardens are endowed with ecosystem characteristics, even though allochthonous or exotic species may be used. Therefore, Urban and Periurban Green Infrastructures (UPGI) should seek their main objective, human welfare, in harmony with a contribution to biodiversity conservation.</p> <p>Within the objective of human well-being, health, both physical and psychological, stands out. Therefore, in hospitals it was common to have gardens that provided patients with a space for rest and recuperation outside the rooms (Zijlema, 2019). Sanatoriums were usually located in coastal or mountainous areas so that users could benefit from contact with nature. In this regard, Twohig-Bennett and Jones (2018) summarize the findings of 143 investigations in green spaces, which were defined as 'open, undeveloped places with natural vegetation' as well as urban green spaces in which parks and green areas on streets were included. The authors conclude that greater exposure to green space is associated with lower risk of type 2 diabetes (28% lower, according to data based on six studies), lower resting heart rate (2.6 beats per minute lower on average, according to 10 studies) and lower diastolic blood pressure (2 mm Hg lower on average, according to 12 studies). In addition, exposure to green spaces was also associated with better birth outcomes, with a reduced risk of preterm delivery (13%, according to data based on six studies) and less risk of failure to thrive for gestational age (19% less, according to data based on four studies). Moreover, the risk of all-cause mortality and cardiovascular mortality was found to</p>

	<p>be 31% and 16% lower, respectively, in those with higher exposure to green space compared to those with lower exposure. People with high exposure to green spaces reported better perceptions of their health status. Specifically, the probability of reporting good health was 12% higher than for people with less contact with green spaces.</p> <p>There are also indications that exercising in a natural environment has additional benefits compared to exercising indoors. Nature offers a place for stress reduction and the restoration of attention, which leads to subsequent mental health benefits. In urban settings, green spaces constitute meeting spaces, facilitating social interaction and cohesion in neighborhoods, and help prevent loneliness, contributing to improved health (Twohig-Bennett and Jones, 2018).</p> <p>Health professionals are again taking into account the potential of nature visits, not only through hospital gardens and sanatoriums close to nature, as in the past, but also as part of a structured and non-pharmacological approach to health problems, not forgetting that they can also prevent diseases and reduce the costs derived from medical care (Zijlema, 2019). UPGIs are necessary components to provide healthy, sustainable and habitable cities, according to WHO.</p> <p>In today's health landscape, respiratory diseases, and in particular viral pandemics, are related to air quality. Trees are known to help filter air pollution (particles and gases) and act as a noise-reducing barrier. They absorb heat and provide shade, lowering up to 4°C in summer. Improving thermal well-being requires increasing the cover of taller trees, reducing the percentage of paved land and designing the landscape, taking into account aesthetic aspects that improve subjective perception (Sun et al. 2017). Perceived biodiversity also turns out to be an influential component of health. The relationships for which there is most evidence are bird richness, plant species richness, habitat richness, and butterfly richness (Aerts et al. 2018).</p> <p>The work hypothesis is that urban and peri-urban green infrastructures provide multiple ecosystem services, and are a mitigator of the effect of diseases and pandemics on the health of urban dwellers.</p> <p><u>Objectives</u></p> <p>The first objective of the Doctoral Thesis is to evaluate the mitigating effect of urban and peri-urban green infrastructures on pandemic damage.</p> <p>The second objective is to analyze the relationship between biodiversity and public health.</p> <p><u>BIBLIOGRAPHY</u></p> <p>Aerts, R., Honnay, O., & Van Nieuwenhuysse, A. (2018). Biodiversity and human health: Mechanisms and evidence of the positive health effects of diversity in nature and green spaces. <i>British Medical Bulletin</i>, 127(1), 5-22. Oxford University Press.</p> <p>Sun, Shibo ; Xu, Xiyan; Lao, Zhaoming; Liu, Wei; Li, Zhandong; Higuera García, Ester; He, Li & Zhu, Jianning (2017). Evaluating the impact of urban green space and landscape design parameters on thermal comfort in hot summer by numerical simulation. <i>Building and Environment</i> 123: 277-288. October 2017. https://doi.org/10.1016/j.buildenv.2017.07.010</p> <p>Twohig-Bennett C, Jones AP, 2018. The health benefits of the great outdoors: A systematic review and meta-analysis of greenspace exposure and health outcomes. <i>Environmental Research</i> 166: 628-637.</p>
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	<p>Zijlema WL et al. 2019. The longitudinal association between natural outdoor environments and mortality in 9218 older men from Perth, Western Australia. <i>Environ Int</i> 04 10;125:430-436. <u>Scientific-technological description of the proposed PhD thesis.</u></p> <p>The proposed PhD Thesis will evaluate the ecosystem services of urban and peri-urban green infrastructures related to human health, especially in the case of pandemics. These effects will be studied at the level of public health, physical, psychological, depending on the typologies of urban and peri-urban green infrastructures, and in relation to biodiversity. Particular attention will be paid to the effects of green infrastructures on the cardio-respiratory system, mortality risk, stress level, immune system enhancement, physical activity, mental fitness and sociability. First, a representative number of large urban centers will be selected, such as Madrid and other similar cities, in which an inventory of UPGI will be carried out, requesting the data from the town planning and environmental departments and councils. At the same time, Remote Sensing and Geographic Information Systems (GIS) will be used to locate and quantify the UPGI. The UPGIs will be characterized by typology and biodiversity indicators.</p> <p>For example, Hospitales de Madrid (HM) has made available to the international scientific community an anonymized clinical database with all available information on patients treated in its hospitals for the SARS-CoV-2 virus. Similarly, other databases will be explored in the areas under study.</p> <p>Thirdly, the health data previously collected in the GIS will be geolocated to relate them spatially to the presence of UPGI and levels of biodiversity characterized in the first phase.</p> <p>Finally, a geostatistical analysis of the relationships found will be carried out, and the corresponding conclusions will be drawn regarding the objective of the Thesis and its starting hypothesis. Research methodology and work plan.</p> <p><u>The methodology and work plan will be articulated in tasks:</u></p> <ol style="list-style-type: none"> 1. Experimental analyses will be designed comparing different types of urban concentrations, by size and population density in each municipality. An exhaustive search for the presence and density of urban and peri-urban green infrastructures in large populations, and in medium and small cities will be carried out. Data sources: government agencies and spatial databases (Sentinel, Landsat, SPOT, etc.). 2. Localities and urban districts will be classified according to the presence of protected natural or semi-natural spaces and visitable periurban forests, parks, gardens, landscaped squares, tree-lined avenues, by means of automatic techniques of Artificial Intelligence (Random Forest, neural networks, Vector Support Machine). 3. In parallel, anonymized public health data (incidence of pandemics and other epidemics, cardio-respiratory diseases) will be collected from health authorities and hospitals, ensuring compliance with data protection laws and equivalent directives. Geolocation of health data in a GIS. 5. Cross-analysis of the presence of UPGI and health data using geostatistical techniques. 6. Conclusions and writing of the Thesis. <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Chronogram: TASKS</th> <th style="text-align: center;">year 1</th> <th style="text-align: center;">year 2</th> <th style="text-align: center;">year 3</th> </tr> </thead> <tbody> <tr> <td>1. UPGI characterization IV</td> <td style="text-align: center;">XXX</td> <td style="text-align: center;">XXX</td> <td></td> </tr> <tr> <td>2. Urban Typification UPGIs</td> <td style="text-align: center;">XXX</td> <td style="text-align: center;">XXX</td> <td></td> </tr> <tr> <td>Secondment at U. Cambridge/Bangor</td> <td style="text-align: center;">X</td> <td></td> <td></td> </tr> </tbody> </table>	Chronogram: TASKS	year 1	year 2	year 3	1. UPGI characterization IV	XXX	XXX		2. Urban Typification UPGIs	XXX	XXX		Secondment at U. Cambridge/Bangor	X		
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TRAINING ACTIVITIES	<p>The candidate will be trained on knowledge of the natural environment, ecology and biodiversity, ecosystem services and environmental indicators, as well as technological tools, remote sensing and GIS, statistics and geostatistics. In addition, it will make relevant contributions to areas of public health and urban planning.</p> <p>The candidate will benefit from national and international contacts established by the research group. One of the academic objectives of this Thesis is the realization of the International Doctorate, for which it is necessary that the doctoral candidate carries out stays of at least three months of duration in foreign research centers. These stays will be hosted by research teams at the forefront of studies on the ecological characterization and biodiversity of wild areas. Therefore, the PhD student will benefit from learning remote sensing-based analysis technologies and their use in urban and peri-urban planning.</p>																																				
SECONDMENT(S)	<p>Tentative secondments</p> <p>Among the most important contacts of the proposer and his SILVANET Research Group are:</p>																																				

	<p>the Universities of Cambridge and Bangor in the United Kingdom, where the PhD student will stay in the fourth quarter of the first year, and the Universities of California Berkeley (stay in the third quarter of the second year) and Oregon (United States, where he will stay in the second quarter of the third year).</p>
REQUIREMENTS FOR CANDIDATES	<p>Degree (MSc, ...): To be in possession of an official diploma of Bachelor's degree, first cycle Degree, or equivalent, plus one of university Master's degree, or equivalent, provided that at least 300 ECTS credits have been obtained in all of these two teachings.</p> <p>Skills: knowledge of Remote Sensing, GIS, R, (Geo)statistics and programming will be welcome.</p> <p>Background: Forestry, Environmental Sciences, etc.</p>

RESEARCH LINE 11B	
COMPANY	Fundación Tatiana Pérez de Guzmán el Bueno
PhD THESIS SUPERVISOR (UPM)	<p>Prof. Dr. Carlos Gregorio Hernández Díaz-Ambrona <i>Agricultural, Food and Biosystems Engineering School Department of Agricultural Production (PhD in Agro-environmental Technology for Sustainable Agriculture)</i></p>
PhD THESIS CO-SUPERVISOR (COMPANY)	<p>Co-Supervisor: Dr. Álvaro Matud Juristo <i>Director of Institutional and Academic Relations Fundación Tatiana Pérez de Guzmán el Bueno</i></p> <p>Tutor: Mr. Jesús Zamora Rodríguez <i>Director of Projects and Investments Fundación Tatiana Pérez de Guzmán el Bueno</i></p>
DESCRIPTION OF THE PhD THESIS PROJECT	<p>The natural space bordering the urban area: Observation base to know the functioning of natural ecosystems.</p> <p>This proposal will study Four pillars of sustainability: Environmental, Social, Economic, and Governance applied to the functioning of natural systems in border, semi-natural, and extensive agricultural areas (agro silvo pastoral dehesa) so as to fill an important scientific gap. The issue is relevant worldwide, given the complexity of managing these spaces, as can be seen in the unfortunate events of large forest fires that have affected catastrophically from California to Australia, not only due to the cost of human lives, but also due to the loss of their natural values. Also due to the role that these buffer spaces present for the deposition of tropospheric ozone and other elements such as nitrogen. It is necessary to provide scientific knowledge for a better integrated and sustainable management of these frontier environments.</p> <p>To know the operation of High Natural Value spaces in the surroundings of large city and their metropolitan area. It proposes a new reflection of the dialogue between country and city. The idea of a green corridor around the city of Madrid (the so-called "Bosque Metropolitano", metropolitan Forest) and its connections to the surrounding forest, requires studying how this space can function. The metropolitan forest raises the connectivity of the green infrastructure of the city and its surroundings, so it also transcends the peri-urban space, the European Union catalogs the spaces of High Natural Value in application of the Habitat Directive 92/43/EEC, as dehesas, and most of the peri-urban environment of the city of Madrid some of its elements are declared a World Heritage Site. Buffer zones in Mediterranean environments are very fragile. Especially the Mediterranean vegetation and the pastures in particular are especially sensitive to changes. This comparison will allow a better analysis of extensive</p>

	<p>grazing systems and a better understanding of their implications on the conservation of terrestrial ecosystems (SDG 15) and on climate action (SDG 13). Mitigation and adaptation to climate change (SDG13): Agroforestry systems, which integrate practices that combine a woody component (tree or bush) with an agricultural component, are characterized by greater carbon sequestration in the woody component and in the soil compared to exclusively agricultural systems. For the study of the possibility of adaptation and mitigation, the use and improvement of the Dehesa Model © software created by AgSystems. The management of space on the edge of urban areas has to take into account the establishment of a dialogue between urban, rural and environmental space. This trinomial lays the foundations for the development of this thesis project. Inappropriate management of animals, domestic or wild, can have disastrous consequences.</p>
TRAINING ACTIVITIES	<p>The cross curricular courses offered by the International Doctoral School (EID). Specific training activities to the development of the doctoral thesis: developing and writing a thesis, participation in congress or conferences, published papers, participation in research project. Training in system dynamics modelling. Ecosystem-based adaptation. Training in on innovation for more sustainable and resilient cities.</p>
SECONDMENT(S)	<p>Tentative secondments (with a minimum of 3 months) 1.- IABS (Instituto Brasileiro de Desenvolvimento e Sustentabilidade) in Brasil to study the Project Cidade Inclusiva (Maceio, Alagoas). 2.- The University of Melbourne (Melbourne, Australia). The Victorian Eco-Innovation Lab (VEIL) is a research-design-action group focused on innovation for more sustainable and resilient future cities. It is an interdisciplinary group whose work is engaged with and embedded in industry, government and society. 3.- Zamorano University (Tegucigalpa, Honduras), Uyuca Biological Reserve (RBU). The Uyuca Biological Reserve provides ecosystem services of great value, especially potable water for Zamorano community. The University manages nearly 3000 ha of forest in which students take part by means of the learning by doing training program</p>
REQUIREMENTS FOR CANDIDATES	<p>Degree (MSc, Engineers, ...): Master in Strategies and Technologies for Development , Specific Training Course “SDGs and cities”, MSc in Agro-Environmental Technology for Sustainable Agriculture and similar studies. Skills:</p> <ul style="list-style-type: none"> - In fields related to the environment or sustainable agriculture, agronomy, agricultural engineering, forestry, environmental sciences, ecology and similar career - Multidisciplinary and transversal skills - Capacity for comprehension and correct spoken and written communication, including the comprehension and use of specialized language (English and recommended Spanish) - Capacity to work as part of a group in multidisciplinary, multicultural and international teams. - Capacity to formulate creative solutions to problems involving consideration of social or ethical responsibility. - Adaptability, initiative, capacity for independent learning, the ability to manage frustration, and emotional intelligence.

	<ul style="list-style-type: none"> - Capacity to carry out R&D+i projects, designing and conducting experiments, analysing results and drawing conclusions. - Communication skills. <p>Background:</p> <ul style="list-style-type: none"> - Graduates with science, technology, engineering, art and applied mathematics backgrounds. - Understanding of and ability to apply environmental assessment and management methodologies in agronomy and forestry
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RESEARCH LINE 12A	
COMPANY	Optiva Media
PhD THESIS SUPERVISOR (UPM)	Prof. Dr. José Manuel Menéndez García <i>Telecommunications Engineering School Signals, systems and radio communications department</i>
PhD THESIS CO-SUPERVISOR (COMPANY)	Dr. Iñaki Martínez Sarriegui <i>Optiva Media</i>
DESCRIPTION OF THE PhD THESIS PROJECT	<p>Content consumption habits are changing, with increasingly demanding consumers that require total control of what, when and where they consume, and with old (linear TV) and new (VoD, streaming) paradigms coexisting.</p> <p>This favours the emergence of new technological and business actors, creating an overwhelming collection of available contents, growing every day with the addition of new series and films in an increasing offer of platforms and streaming services.</p> <p>In this context, actual techniques for content search and indexation fail at providing high-level semantic capabilities, especially in textual documents when capturing the intention and/or the underlying narrative structure. The result is a huge amount of information and metadata inaccessible to automatic processing and ‘unembraceable’ by humans.</p> <p>The most direct consequence of this is that <i>end-users spend more than 30 minutes a day</i> deciding what to watch on TV, and frequently ending in selecting a content that doesn’t fit their interests or their actual mood, and that will usually be later discarded.</p> <p>While for most people this generates only some discomfort and the obvious feeling of wasting their time, in people with mental conditions like depression it could lead to anxiety episodes and other more severe complications derived from idling and, especially, for ending with the selection by discard of a content that could be harmful in psychological terms.</p> <p>In this doctoral thesis, we propose addressing this problem by means of the work in two areas: <u>Conceptual Content Modelling</u> and <u>User Profiling</u>, the outcomes of which will be combined to create an advanced recommendation framework for a ‘safe’ TV experience for people suffering from mental conditions, ultimately contributing to their wellbeing.</p>
LIST OF TRAINING ACTIVITIES	<ul style="list-style-type: none"> - Doctoral courses at UPM - Dedicated training on Digital and Pay TV at Optiva Media with technical support from the GATV-UPM. - AWS AI-ML tools webinars and specific company courses at Optiva Media - Attendance at International Artificial Intelligence conferences related to the thesis project like AIME, AIAI; with active participation on practical workshops. - Short stays of the student in institutions of recognised prestige in the field of the doctoral thesis.

SECONDMENT(S)	<p>Tentative</p> <ul style="list-style-type: none"> - Computational Intelligence Group, Vrije Universiteit (Netherlands) <ul style="list-style-type: none"> o https://cs.vu.nl/ci/ - Digital Health & Wellbeing Group, Fondazione Bruno Kessler (Italy) <ul style="list-style-type: none"> o https://www.fbk.eu/en/digital-healthwellbeing/ - Fraunhofer FOKUS (Germany) <ul style="list-style-type: none"> o https://www.fokus.fraunhofer.de/en/fokus/research-topics/ai - LIAAD, Artificial Intelligence and Decision Support Centre of the INESC TEC (Portugal) <ul style="list-style-type: none"> o https://www.inesctec.pt/en/centres/liaad#intro - Centre for Research & Technology Hellas (Atenas, Grecia) <ul style="list-style-type: none"> o https://www.certh.gr/root.en.aspx
REQUIREMENTS FOR CANDIDATES	<ul style="list-style-type: none"> - Degree (MSc, ...) <ul style="list-style-type: none"> o MSc in Statistics, applied mathematics, Computer Science or related discipline. - Skills <ul style="list-style-type: none"> o Strong problem-solving skills o Ability to communicate complex data in a simple, actionable way. o Ability to work independently and with team member from different backgrounds. o A drive to learn and master new technologies and techniques. - Background <ul style="list-style-type: none"> o Proficient with one or more programming languages, preferably Python and/or C++ o Knowledge of a variety of ML techniques: NLP, clustering, decision tree, ANN, DL, RNN, ... o Pattern recognition and predictive modelling experience o Knowledge of cloud infrastructures like AWS and their AI tools and services

RESEARCH LINE 12B	
COMPANY	Optiva Media
PhD THESIS SUPERVISOR (UPM)	Prof. Dr. Carlos Á. Iglesias <i>Intelligent Systems Group</i> <i>Telematic Systems Engineering Department</i> <i>Telecommunications Engineering School</i>
PhD THESIS CO-SUPERVISOR (COMPANY)	Dr. Iñaki Martínez Sarriegui <i>Optiva Media</i>
DESCRIPTION OF THE PhD THESIS PROJECT	<p>Title: Exploiting Knowledge Graphs for Improving Mental Wellbeing at Home through Content-based Recommendations</p> <p>The PhD thesis aims at researching on personalized content recommendation algorithms for selecting videos. One of the goals of the projects is reducing users' frustration when selecting videos and contribute to user personal well-being. To this end, the project will explore the usage of Knowledge-Graph based Recommendation Systems.</p> <p>The PhD thesis will be developed in a combined academic and industrial settings, from an industry-driven perspective.</p> <p>Candidates are expected to publish in highly refereed journals and conferences. The grant will support a research stay of 3 months.</p>
SECONDMENT(S)	The hosting research centre of the research stay will be decided during the PhD studies. Some potential hosting research centres are University of Torino (Italy), University of Minho (Portugal),

	Findazione Bruno Kessler (Italy), and Open University (UK).
REQUIREMENTS FOR CANDIDATES	Degree: Master's degree in computer science or other relevant disciplines. Skills: Python, Pandas, Scikit-Learn, Linked Data Technologies. Background: Artificial Intelligence, Machine learning, Natural Language processing. Strong motivation to do research on data management and doing interdisciplinary research. Communication skills and teamwork.