https://doi.org/10.4233/uuid:e70d9b6d-ba2a-4c11-81c0-ee1203dc4198

A 3D Approach of Greece's Property Law on Urban Environmental Pollution

Dionysia – Georgia PERPERIDOU and Andreas XYDOPOULOS, Greece

Key words: 3D emissions, property law, building code, Hellenic Cadastre

SUMMARY

The introduction of Greece's Civil Code, in 1946, signaled the transition from the then applicable Roman-Byzantine Law, known as Armenopoulos Exabiblos, to a modernized legal framework. The Greek Property Law, Civil Code Book 3, it is consisting of a bundle of rules, regulations and restrictions on properties, property rights and properties use and exploitation. Even though Property Law was introduced in 1946, it includes a provision, rules and restrictions that were and still are innovative. Besides the definition of rights in rem, like full or limited ownership or usufruct, Property Law introduces legal definitions with technical aspects for rules, regulations and restrictions on property installations that produce emissions, like air, heat, noise or vibrations, creating nuisance or even environmental adverse effects, with negative impact to neighboring properties use and exploitation, so as neighboring properties and their owners are legally protected against any harmful effect.

The explicit technical description of the above mentioned Property Law rules, regulations and restrictions on emission, are included in Greece's Building Code. Building Code sets a detailed legal – technical framework and technical specifications on buildings installations such as central heating systems, restaurants ventilation systems, heating panels, small industry machineries or even advertising signs that could emit dazzling light, so as their emissions are limited to tolerable limits by relevant legislation on air pollutants, noise pollution etc..

Over the years, an important aspect for urban development in Greece is the cleaner urban environment. Thus the incorporation of Property Law and Building Code provisions on emissions in the Hellenic Cadastre is crucial, in order to incorporate environmental parameters monitoring into it, facilitating spatial development, land administration and land monitoring and overall sustainable development.

Herein a research on the environmental aspects of Property Law in three-dimensional level is presented. The research is focused on construction regulations and restrictions for buildings heating and restaurants ventilation systems that are thoroughly-legally documented in Greek Property Law, are in detail technically described in the Greek Building Code and are a serious urban environmental polluter. Further more research is focused on incorporating the above mentioned 3D legally and technically described regulations and restrictions into the 2D Hellenic Cadastre registry.

A 3D Approach of Greece's Property Law on Urban Environmental Pollution

Dionysia – Georgia Ch. PERPERIDOU and Andreas XYDOPOULOS, Greece

1. INTRODUCTION

From the early beginning of the industrial revolution until nowadays, urban environment is complex, diverse and multidimensional, influenced by resident's activities and the regulatory intervention of local, regional and state governments or supranational organizations and bodies, whereas urban environmental pollution is one of the biggest problems and challenges that modern societies have to deal with (D. G. Perperidou 2010). Industrial revolution coincided to the fall of the feudal system and the introduction of the *numerous clausus principle* that established the right of individuals to own their own private immovable property/ land, defining that property rights can be created, modified, transferred and extinguished (Van Erp 2003). By mid-18th century and as the first industrial societies were evolving, through the vast urbanization of the then existing cities, urban environment degradation in combination to poor sanitation conditions resulted to population severe health risks. Already from the 18th century building activities restrictions in respect to public health protection were foreseen. Affected by Edwin Chandwick's 1842 document *The Report from the Poor Law Commissioners on an Inquiry into the Sanitary Conditions of the Laboring Population of Great Britain*, the 1848 UK's Public Health Act included and enacted for the first time a series of new rules and restrictions on how new houses building and streets would be formation, so as to protect public health (Morley 2007), affecting the exercise of private property rights and property exploitation. In the USA, the 18th century Nuisance Law, permitted state officials to fine or to imprison property owners for their property maluse that caused damage to the community or the neighborhood, while individuals were granted the right to sue and ask for monetary compensation due to injuries caused by neighboring property owners activities or even the right to sue so as the neighboring property's harmful activities would be stopped (Rosen 2003). In the 20th century and gradually, property rights were defined as a *bundle of rights*, series of legal relationship, also of technical aspects, between individuals or individuals and the state and property owners do not have the right to do whatever they want with their property, but ought to respect and comply to certain rules, regulations and restrictions imposed by public authorities, like land uses, maximum building surface etc. (Johnson 2007).

As by the mid-1950's urban growth continued, urban pollution from neighboring properties or neighboring public infrastructures, like urban freeways, affected individuals' health causing serious health problems and property value devaluation, thus those individuals have the right to permeant compensation, like in Boomer v. Atlantic Cement Co case (Schneiderman, Cohn, and Paulson 1970; Farber 2005). In respect to environmental protection, already from the 18thn century the Tort Law affected property rights. In numerus cases Tort Law benefited property owners that polluted with chosen activities installed in their properties and caused adverse effects natural environment (Dewees 1992; Cole and Cole 2002). To limit pollution and environmental degradation, partial or full charges to property owners so as to clean up

contaminated sites of their properties leading to cleaner property exploitation practices (Segerson 1994) and those charges could be characterized as a financial restriction to property full use. To protect cultural heritage further restrictions on property exploitation are imposed and in cases of archeological sites of great importance those restrictions are equelevant to expropriation (Theodoropoulos and Perperidou 2019). As human activities get more complex and achievement of individuals financial stability is even more imperative, intermediate property rights arose, like in cases of groups that were granted the free right to install in their properties pollutant and harmful, to others activities, but this free rights is limited to a certain level, after which penalties and fines are imposed (Kotchen and Segerson 2019) as polluter-pays principle defines, but according to ECJ's, polluter –pays principle could not go beyond polluters contribution to the creation of the problem and the pollution imposed fine ought to be proportional (Bleeker 2009).

The challenges that cities have to confront due to climate crisis, the need to reduce buildings energy consumption and the need to construct sustainable and greener buildings, led to the enactment of building regulations that encompass new restrictions to building activities (Sussman 2008; Wong, Chan, and Lam 2012) affecting property rights. Nowadays property development must to comply with certain construction regulation and use specific construction materials, so as property exploitation is not harmful to the environment (natural or man-made) and the common good. For example the USA LEED standards affected properties exploitation due to financial costs of new material and building techniques (Fox 2010).

Properties and properties rights are documented and recorded mainly in cadastral systems. Over the last decade the ongoing research focuses on the development of 3D records or 3D data types to support the development of 3D cadastral systems (Germann, Lüthy, and van Oosterom 2018), to encompass to 3D cadastral data of no legally described objects of the real world like informal settlements (Griffith-Charles and Sutherland 2018), on the 3D aspect of legislation on environmental protection of both natural and cultural environment (Kitsakis 2018). The legal and technical aspect of 3D properties or property rights, rules and restrictions is also an area of research over the last decade (Paulsson and Paasch 2013), but this 3D legal and technical properties is not thoroughly, extensively and in depth examined, compared to 3D properties technical aspects (Paasch and Paulsson 2021).

Herein a research on the environmental aspects of Property Law in three-dimensional level is presented. The research is focused on construction regulations and restrictions for buildings heating and restaurants ventilation systems that are thoroughly-legally documented in Greek Property Law, are in detail technically described in the Greek Building Code and are a serious urban environmental polluter. Further more research is focused on incorporating the above mentioned 3D legally and technically described regulations and restrictions into the 2D Hellenic Cadastre registry.

2. GREECE'S PROPERTY LAW: AN OVERVIEW

Greek Property Law (PL) was enacted in 1946, Book 3 Greek Civil Code, even though it was originally presented in 1939. The 1946 Greek Property Law replaced the precedent Byzantine

– Roman Law legislation, which was officially enacted in 1832 by King Otto, the first King of the then newly established Greek State. Greek Property Law defines 4 property rights: ownership, easement, pledge and mortgage, subjected to restrictions imposed by various other legislations, in respect to common interest and common good, forming a sphere of public power exercise in private property rights (Balis 1951). 1946 Greek PL direct reference on restrictions of property rights or on regulations impose to property exploitation, addresses property rights in the aspect of bundle of rights and not as a stand-alone definition of owners absolute right to exploit their property as they please, in a period that bundle of rights was under discussion, thus the Greek PL is an innovative legal framework on properties and property rights.

Greek PL Art. 1000 defines that "*the owner of the thing can, as long as there are no conflicts to the law or the rights of third parties, to use it as the owner pleases and to exclude any third party action on it*", regulates property use and exploitation in respect not only to the rights of third parties, but mainly in relation to other legislations, e.g. on land uses, building codes, transportation, sanitation – hygiene or even protection of the environment, in respect to State's obligation to safeguard common good and common interest. In general, those Greek Property Law restrictions, e.g. due to air flights, underground development or utilities network development, are three – dimensional **Figure 1** (D.-G. Perperidou et al. 2021).

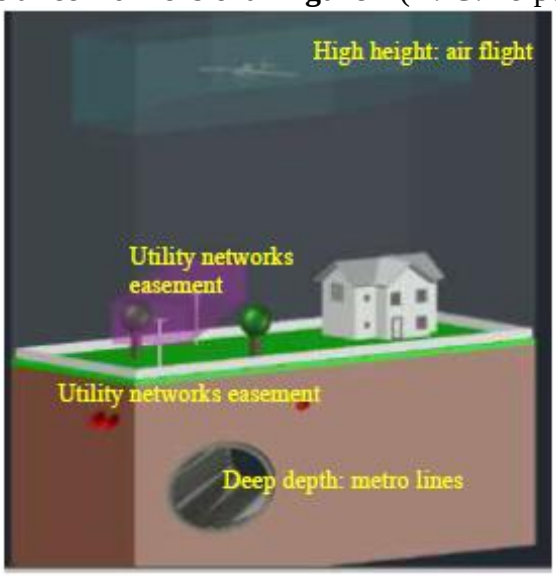


Figure 1: 3D property right and restrictions acoording to Greek PL (Perperidou et al. 2021)

Greek Property Law reference to the "law" and restrictions or regulations impose to absolute property use derives from the precedent legislation, the Byzantine – Roman Law, the "*Hexabiblos of Armenopoulos*". The Hexabilos of Armenopoulos is an official and complete legal handbook on valid legislation from 1345 (late Byzantine Era) to 1946, was the legal code that Greeks used for their affairs arrangement during the Ottoman era (Penna 2015; Christakou 2019), is the fundamental legal document that affected modern Greek legislation on properties and property rights and which also combined property rights with environmental protection and nuisance, caused to neighboring properties, control and minimize.

In his second book Armenopoulos includes and presents a series of detailed rules, regulations and restrictions on buildings construction in respect to neighboring properties and buildings, new building's main use and dominant wind direction, in order for smoke coming out of chimneys not to cause air pollution nuisance to the neighboring properties and prevent fire spreading in case of fire incidence (Spanos 1793). For example in the case of private baths ventilation chimney should be constructed in a distance from neighboring properties, in adequate high and in respect to dominant wind direction and wind flow of the building location, so as the emitted smoke would not cause nuisance to neighboring properties. For professional buildings, distinct regulations were in force depending on building category and use, e.g. bakeries should be in a distance from residencies and preferably in a higher altitude from residential areas, while workshops for pottery, forges, glassworks, dye houses, lime kilns etc. certain rules/regulations and restriction regarding their distance from other buildings, the chimney height of their ventilation systems, their spatial location in respect to residential areas (Spanos 1793), ought to be respected and followed.

3. LEGISLATIVE & REGULATORY FRAMEWORK ON PROPERTIES EMISSIONS AND EMISSIONS INSTALLATIONS AND 3D

3.1 Greek Property Law and environmental protection

Greek PL includes provisions on environmental protection in various sections and articles. Articles 966-971 forbid any transactions on commonly owned immovable things, like waters of free and perpetual flow, seashores, ports, navigable rivers (including their banks), major lakes (including their banks), streets or squares. For surface running waters PL foresees that low level agricultural plots/properties owners do not have the right to build any construction, that could change or prevent waters natural flow on steep slope or rough terrain (Art. 1024) (Balis 1951), **Figure 2**. In properties that are within the regulatory framework of urban plans buildings' rooftops must prevent rain-water from entering neighboring properties respectively and accordingly to relevant legislation provisions so as rain-water would be directed either within property boundaries or to street kennel (Balis 1951), **Figure 2**.

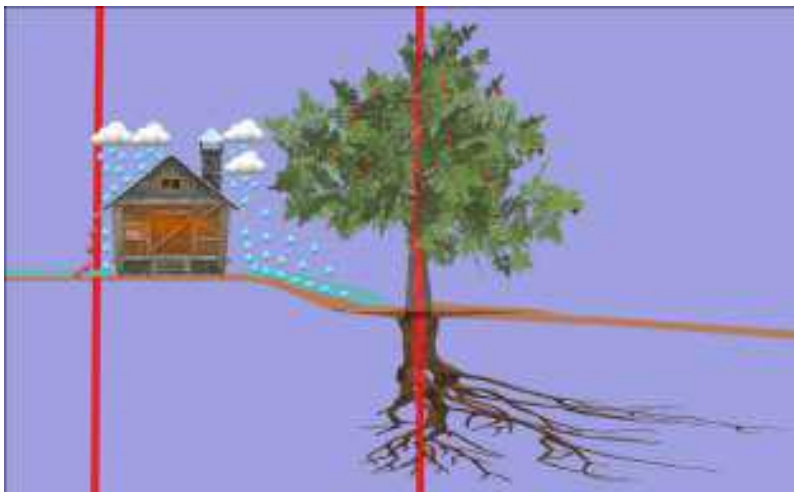


Figure 2: Cross-section of plot and its boundaries according to Greece's PL's rights & restrictions on rain water surface/ roof (Perperidou et al. 2021).

Greek PL also includes provisions that ensure high standards in living conditions and build - environment protection, e.g. window natural light entering easement, view easement and non in-height development easement, technically and in detailed described in relevant to buildings construction legislation.

In respect to common good and society's economic development, a plot owner has to tolerate under or over the ground easements for utility networks development and operation, e.g. water, rain or gas tubes and pipes and overhead or underground electric cables, passing through his property, Figure 1. Owner is eligible for receiving an appropriate compensation, and even if those utility network easements might cause environmental degradation to his property, he has no right to object to them, as common good is prioritized and served (Balis 1951).

A property owner is obliged to tolerate environmental pollution from emissions like, smoke, soot, fumes, heating, noise, vibrations, electromagnetic energy, or brilliant light, coming from installations on neighboring property under the condition that those emissions are not essentially harmful to property use and are common to all the properties of the area (Art. 1003). Emission tolerance of PL derives from BLR the equelevant provisions. In Art. 1003 by introducing the term "usual use of all properties located within a specific area", Greek PL directly addresses to official land use enacted by official administrative and regulatory acts, thus PL foresees that a private property is subjected to the regulatory framework of urban and spatial planning. In respect to the "usual use of a property and its neighboring ones", PL recognizes that this usual use differs in city centers compered to rural settlements or to areas that attract tourist and are holidays destination, while residential areas have different property usual use than industrial areas. The installation of a factory in a residential area does not meet the criteria of "properties usual use" and is a pollution source, while a property owner cannot forbid the operation of a factory in an officially characterized industrial area, even if this factory is a pollutant factor. Consequently, it is essential when examining the tolerance or non-tolerance of a property owner to neighboring property emissions, first to examine land uses regulatory framework and respectively, pollution regulatory framework. However, a property owner can prevent a construction or an installation in neighboring property that definitely harms and pollutes, in short or long term, his property, even if this construction or installation has obtained an official permit according to the law (Art. 1004, 1005).

3.2 Property Law, air emissions and the third dimension

Characterization of air emissions, e.g. emitted from heating ventilation systems due to fossil fuels combustion, as not harmful hence no-pollutant to neighboring properties, their spatial and 3D dispersion must be also thoroughly examined, besides installation usual use compered to neighboring properties. In residential areas heating systems are of common use, so they are not considered as harmful to neighboring buildings, as long as emissions are emitted in an adequate height and thus 3D emissions dispersion could not directly affect neighboring properties, Figure 3. To safeguard tolerance to emissions/ pollutants, combustion fuels used for heating systems are regulated by official governmental acts.

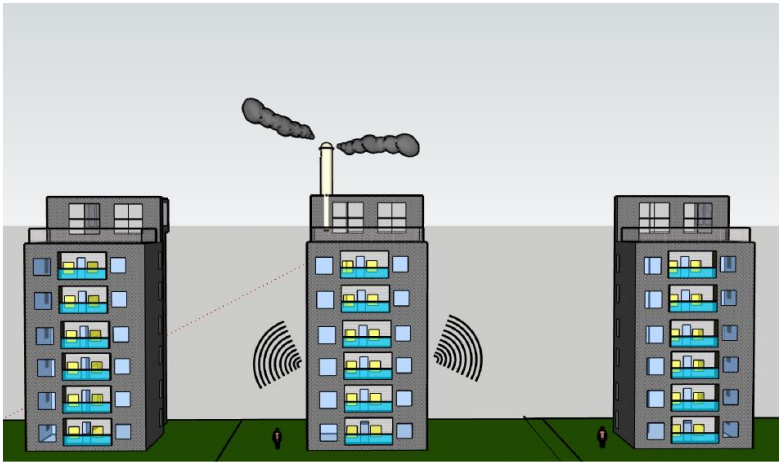


Figure 3: Tolerant emisssions of heating vendilation systems in urban residential area, 3D reprasantation , (3D representation writers own processing)

Respectively emissions emitted from restaurants ventilation systems, that their installation and operation in residential areas is allowed, should also be tolerated as long as emissions are not 3D dispersed directly on neighboring properties, Figure 4, and emissions/ pollutants concentration levels are below official regulative acts.

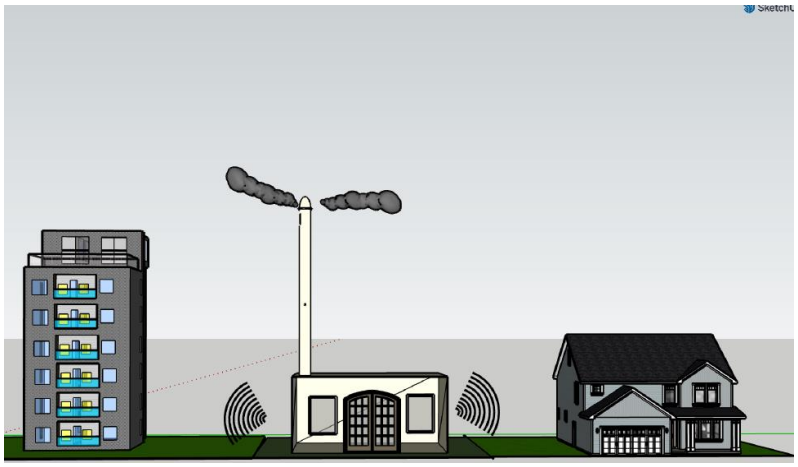


Figure 4: Tolerant emisssions of Heating vendilation systems in urban residential area, 3D reprasantation, (3D representation writers own processing)

On the other hand a factory operation within in a residential area cannot be tolerated, as the factory does not fall under the definition "property usual use", emissions levels are way above officially defined for urban areas and consequently, emitted emissions are harmful to neighboring properties, polluting the environment, affecting air quality and consequently the main factor for downgraded urban environment, Figure 5.

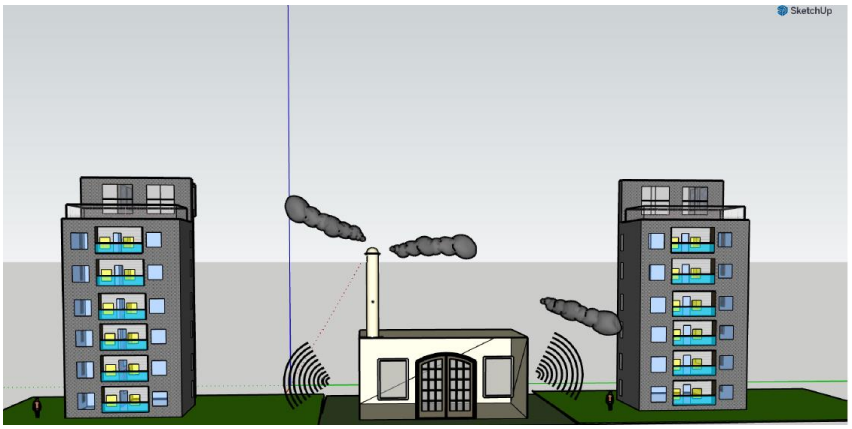


Figure 5: 3D representation of direct adverse effects of harmfull instalations to neighboring properties, (3D representation writers own processing)

Property owners are obliged to obtain an official building or authorization permit from the competent public authorities before the construction and the operation of any installation emitting emissions, in respect to relevant general or specific legislation on constructions, combustion fuels use and pollutants emissions concentration levels. For example if restaurant installations, e.g. cuisine chimneys, are not in compliance to official regulation, violating authorization, excessing official pollutants concentration levels and directly polluting neighboring properties, Figure 6, authorization could be suspended and recalled after an official complain to public authorities.

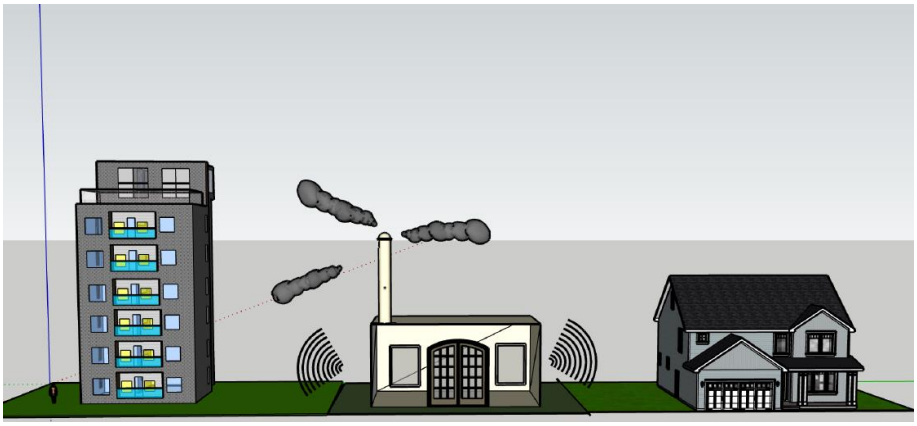


Figure 6: 3D representation of direct affects to neigboring properties of no-comliant to permission regulations installation (3D representation writers own processing).

PL recognizes owner's right to prohibit construction or operation of "harmful installations" in neighboring properties, emitting pollutants harmful for his property and his property interests. Thus a property owner can prevent construction of a factory or a heating ventilation chimney in neighboring property, in case that emissions are directly emitted to his property or if official regulations and legislation on installations and pollutants concentration levels are not met, as such installations have direct adverse effects on his property due to 3D dispersion of excess air pollutants, and contribute to overall degradation of environmental conditions (Figure 5, Figure 6).

3.3 Correlation between 3D provisions on air emissions of Building Code and Greek Property Law:

The legal framework on central heating and restaurants cuisines ventilation system construction, emissions control and prevention is today regulated by the 2012 Building Code, the General Building Regulation, a detailed technical legal document on construction specifications on buildings and installations and the 2017 Ministerial Decision on Sanitary regulations and conditions for the operation of food sector, in respect to minimum nuisance of neighboring properties as Greek Property Law explicitly defines.

The 2012 Building Code includes the general principal on ventilations installations and chimneys construction (for buildings heating or restaurants cuisines ventilation). Chimneys ought to be constructed on the top of the building so as to cause the minimum nuisance to property owners and neighboring properties, **Figure 3**, as emissions are 3D spatially dispersed through the air. Buildings central or individual heating ventilation systems technical specifications are defined in General Building Regulation in respect to 3D spatial dispersion of air emissions. Heating systems chimneys must be constructed:

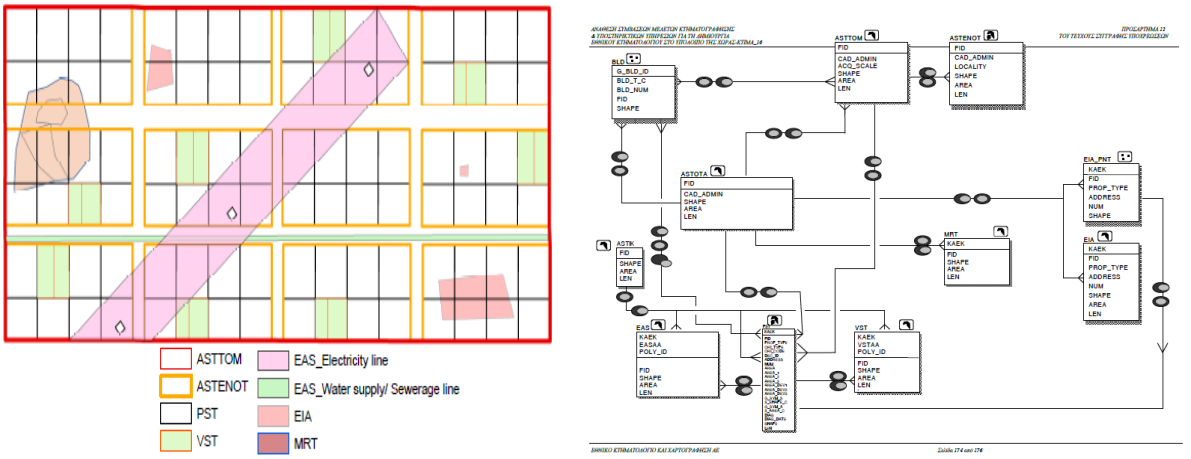
- above the building,
- at least 1 meter above their exit point,
- 0.7 meter above any other building infrastructure (e.g. staircase or/ elevator terminal end) that are within an horizontal distance of 3 meters,
- higher form neighboring buildings openings (e.g. windows, doors etc.) with horizontal distance less than 10 meters, Figure 3 and Figure 4.

Emissions nuisance, e.g. air pollutants levels is controlled and documented by competent authority that has the right to impose administrative measures such as chimney uplift or supplementary measures on emissions nuisance control, so as nuisance is limited to tolerant levels as the Property Law defines. Restaurants ventilation systems must prevent air 3D dispersion of smokes and fumes produced during food preparation, so as to minimize or even to prevent any nuisance that could be caused to customers, employees and neighbors. The Minister Decision on sanitary regulations etc. foresees that restaurants ventilation systems should prevent smoke & fumes 3D spread in indoor restaurant environment in order to avoid indoor air pollution and 3D low height spread in the outdoor environment in order to avoid low level air pollution. Restaurant ventilation systems chimneys construction must:

- comply to urban planning regulations,
- be at least 0.5 meters above the building top
- be in that proper height from the building or any other neighboring building, so as there is no nuisance to neighbors in general, Figure 4.

4. LEGISLATION ON EMISSIONS AND INCORPORATION ON THE HELLENIC CADASTRE

Cadastral legislation explicitly defines that Hellenic Cadastre records rights on immovable things, properties, and any other stand-alone and firmly connected to the ground property object. Each land parcel on which property rights are exercised is in detail depicted in 2D cadastral diagrams as part of the ground regardless of its use or its owner, documented in Hellenic Cadastre spatial (**Figure 7**) and descriptive data base.



ASTENOT: Cadastral Section (building block in Urban Areas)
ASTTOM: Cadastral Sector (10-15 Cadastral sections in Urban Areas
PST: Land parcels
VST: Easements/ Exclusive use
EAS: Utility networks personal limited easement
EIA: special property objects
MRT: Mines

(a) **(b)**

Figure 7: Hellenic Cadastre spatial data base, (a) spatial levels depiction (processed by Perperridoy, (b) ER diagram, source Hellenic Cadastre

However there is no technical and in detail depiction of parcel's components like buildings, other installations, trees, etc.. Only descriptive parameters on building's floors, properties floor and general properties or land parcels use, are documented during the cadastral survey, but those data are not officially available by operative Hellenic Cadastre. But according also to Hellenic Cadastre legislation, detailed records and additional information on the State's official administrative acts or court decisions e.g. land uses, building regulations etc., that contribute to State's organization and sustainable development, should be also incorporated.

4.1 Integration of 3D air emissions regulations and restrictions on the Hellenic Cadastre

Even though property law and relevant legislation on properties clearly and in detail describes legal and technical 3D property rights and restrictions there are not technical specifications for their 3D representation (Perperidou et al. 2021). Building or authorization permits include official approved 2D top views, cross sections and longitudinal models of buildings or installations, while detailed reference on official building regulations and restrictions is incorporated in their 2D land parcel topographic diagram (also including area's contour lines).

The 3D aspect of the Greek Property Law provisions on emissions, correlated to Building Code detailed technical provisions and urban air quality official regulations, could be incorporated into Hellenic Cadastre Spatial and Descriptive Data Base as either legal or technical information on "Land Parcels" entity, parameterized in respect to emission levels, tolerance to pollutants, usual use description and authorization technical details.
The definition of properties usual use is feasible by incorporating to Hellenic Cadastre system additional information on:

- Official acts on land use and spatial planning: municipal/ urban unit level correlated to Hellenic Cadastre "land parcels" entity Hellenic Cadastre Spatial Data Base.

- Official acts on building regulations: building height, total surface, total plot coverage area by the building, correlated to Hellenic Cadastre "land parcels" entity Hellenic Cadastre Spatial Data Base - descriptive information.
- Official regulations on property exploitation and use described in legal documents and deeds and accepted by all property owners within a land parcel: Land parcels entity, Hellenic Cadastre Spatial Data Base - descriptive information.

Tolerance to emissions nuisance by heating or restaurants cuisine ventilation systems definition is feasible by incorporating to Hellenic Cadastre system additional information on:

- Official legislation on air pollutants limits: stand-alone spatial information on Hellenic Cadastre Spatial Data Base.
- Official pollutants spatial dispersion maps: stand-alone spatial information on Hellenic Cadastre Spatial Data Base.

Definition of property owners' rights to emissions installations is feasible by incorporating to Hellenic Cadastre system additional information on:

- Official Building Permits: 2D top views, cross sections and longitudinal models: documents attached to spatial entity Land Parcels.
- Official permissions /authorizations of heating and restaurant ventilation systems: descriptive information for Land Parcel/ Property Entity on Hellenic Cadastre Descriptive Data Base.
- Maximum building height: descriptive information for Land Parcel entity on Hellenic Cadastre Descriptive Data Base.
- Construction characteristics of ventilation system chimney:
  a. Descriptive information: land parcel entity on Hellenic Cadastre Descriptive Data Base.
  b. Official approved drawings: attached to spatial entity Land Parcels.

5. CONCLUSIONS

Greek Property Law foresees regulations and restrictions on emissions, in respect to property owner's right to protect his property from nuisance but defines that owner is obliged to tolerate emissions that do not directly harm his property and are a common and usual characteristic of neighboring buildings such as heating or restaurants ventilation systems. Property law also guaranties a property owner's right to issue an official permit for construction and operation of such installations in respect to specific building regulations and fossil fuels use restriction. All the above mentioned Property Law provisions on emissions and on property owner rights and obligations regarding emissions installations are 3D legal provisions, technically applied in real world 3D space and 3D objects.

Building Code includes the regulatory framework and the detailed technical specifications on construction process, authorization and operation permission of emissions installations, in respect to tolerant nuisance levels, provided by environmental legislation, so as neighboring properties are protected by harmful and pollutant emission levels, as the Property Law explicitly foresees. The construction regularity framework of buildings heating and restaurants ventilation systems, defines 3D legal and 3D technical restrictions in respect

building use, building characteristics and height, the horizontal distance from other constructions on building's top, and the horizontal distance from the 3D neighboring constructions. Thus, the integrated regulatory framework on a property's emissions rights, restrictions and obligations, produces a 3D space for real world objects that are in detailed legally described in three-dimensions, but technically authorized in two-dimensions as relevant constructions and installations are depicted in 2D top views, cross sections and longitudinal models.

The Hellenic Cadastre is developed in 2D and includes technical and descriptive information on land parcels and on other properties developed within land parcels. The real world 3D space on emissions that is legally described in Greek Property Law, in detailed technically documented in Building Code and regulated by environmental legislation, could be incorporated into Hellenic Cadastre Spatial and Descriptive Data Base, through legal and technical information on Spatial Entity "Land Parcel". Thus a hybrid 3D description of real world 3D space, 3D objects and 3D environmental conditions, like emissions, on a 2D cadastral system is feasible. Future research could focus in detailed quantitative and qualitative documentation of Property Law and Building Code 3D emissions provision, in respect to Hellenic Cadastre Data Base development specifications and emission monitoring legislation.

REFERENCES

Balis, G., 1951, *Property Law, According to the Civil Code*. Athens, Greece: Typois Pyrsou.

Bleeker, A., 2009, "Does the Polluter Pay? The Polluter-Pays Principle in the Case Law of the European Court of Justice.", *European Energy and Environmental Law Review* 18 (6).

Christakou, G., 2019, *Building regulations in Kostantinos Armnopoulos Hexabiblos*, Sparta, Greece: University of Peloponnese.
Cole, D. H., and Cole, D., 2002, *Pollution and Property: Comparing Ownership Institutions for Environmental Protection*, Cambridge University Press.

Dewees, D. N., 1992, "The Role of Tort Law in Controlling Environmental Pollution.", *Canadian Public Policy/Analyse de Politiques*, 425–42.

Farber, D.A, 2005, "The Story of Boomer: Pollution and the Common Law.", *Ecology LQ* 32: 113.

Fox, S., 2010, "A Climate of Change: Shifting Environmental Concerns and Property Law Norms Through the Lens of LEED Building Standards.", *Va. Envtl. LJ* 28: 299.

Germann, M., Lüthy, J., and van Oosterom, P., 2018, "INTERLIS 3 Developments with 3D Data Types and Better Constraint Support for 3D Cadastres.", In *6th International FIG Workshop on 3D Cadastres*, 279–90. International Federation of Surveyors (FIG).

Griffith-Charles, C. and Sutherland, M., 2018, "3D Cadastres for Complex Extra-Legal and Informal Situations."

Johnson, D. R., 2007, “Reflections on the Bundle of Rights.”, *Vt. L. Rev.* 32: 247.

Kitsakis, D., 2018., “Determining the ‘True’ Three-Dimensional Environmental Impact of Public Law Restrictions.”

Kotchen, M. J., and Segerson, K., 2019, “On the Use of Group Performance and Rights for Environmental Protection and Resource Management.”, *Proceedings of the National Academy of Sciences* 116 (12): 5285–92.

Morley, I., 2007, “City Chaos, Contagion, Chadwick, and Social Justice.”, *The Yale Journal of Biology and Medicine* 80 (2): 61.

Paasch, J.M. and Paulsson, J., 2021, “3D Property Research from a Legal Perspective Revisited.”, *Land* 10 (5): 494.

Paasch, J.M. and Paulsson, J., 2013, “3D Property Research from a Legal Perspective.”, *Computers, Environment and Urban Systems* 40: 7–13.

Penna, D., 201, “Dans La Tradition d’Harménopoulos… Some Notes on the Tradition of Harmenopoulos’ Hexabiblos in the Netherlands.”, *Groninger Opmerkingen En Mededelingen* 32: 93–110.

Perperidou, D.G., 2010, “Development of Methodology for the Record & Analysis of Systematic Activities & Travels with Use of Geostatistical Methods—Contribution in the Estimation of the Exposure to Air Pollution.”, Ph. D. Dissertation, National Technical University of Athens, Athens, Greece (in greek language).

Perperidou, D.G., Moschopoulos, G., Sigizis, K. and Ampatzidis, D., 2021. “Greece’s Laws on Properties and the Third Dimension: A Comparative Analysis.”, In , 13. Amsterdam, the Netherlands: FIG.

Rosen, C.M., 2003, “’Knowing’industrial Pollution: Nuisance Law and the Power of Tradition in a Time of Rapid Economic Change, 1840-1864.”, *Environmental History* 8 (4): 565–97.

Schneiderman, M.,. Cohn, C.K. and Paulson, G. 1970, “Air Pollution and Urban Freeways: Making a Record on Hazards to Health and Property.”, *Cath. UL Rev.* 20: 5.

Segerson, K., 1994, “Property Transfers and Environmental Pollution: Incentive Effects of Alternative Policies.”, *Land Economics*, 261–72.

Spanos, A., 1793. *Konstantinou Armenopoulou Exabiblos, traslated in common language by Alexios Spanos*, Ioannina: Publishing House Dimitriou Theodosiou.

Sussman, E., 2008, “Reshaping Municipal and County Laws to Foster Green Building, Energy Efficiency, and Renewable Energy.”, *NYU Envtl. LJ* 16: 1.

Theodoropoulos, P., and Perperidou, Perperidou, D.G., 2019, “Transfer of Development Rights & Cultural Heritage Protection: the Case of 3D Urban Implementation Plans.”, In ,

441–52. Volos, Greece: Department of Planning and Regional Development, University of Thessaly (in greek language).

Van Erp, S., 2003, "A Numerus Quasi-Clausus of Property Rights as a Constitutive Element of a Future European Property Law?", *Electronic Journal of Comparative Law* 7 (2): 1–12.

Wong, F.W.H., Chan, E.H.W. and Lam, P.T.I., 2012. "Compliance Concerns of Environmental Laws at Building Design Stage: Transaction Cost Considerations.", *Property Management*.

BIOGRAPHICAL NOTES

Dr. Dionysia – Georgia Ch. Perperidou is Adjunct Lecturer, University of West Attika, Department of Surveying and GeoInformatics Engineering, in the field Cadastre, GIS, Urban Planning and Technical Legislation. Has over 12 experience in Hellenic Cadastre, head of Athens & Voula/Vouliagmeni Survey Offices. Scientific advisor at Hellenic Republic Asset Development Fund/ Helliniko project, Public Properties Company SA, Independent Power Transmission Operator SA, on Cadastre, urban planning, integrated technical and legal documentation of large scale properties and properties rights.

Andreas Xydopoulos is an undergraduate student, at the Department of Surveying and GeoInformatics Engineering, University of West Attika. His is working his diploma thesis on 3D representation of emissions in relation to Property Law and Building Code provisions.

CONTACTS

Dr. Dionysia – Georgia Ch. Perperidou
University of West Attica,
Agiou Spyridonos, Aigaleo, Greece
Tel. +306936852526,
Email: dgperper@uniwa.gr
Web site: https://www.linkedin.com/in/perperidou/

Andreas Xydopoulos
University of West Attica,
Agiou Spyridonos, Aigaleo, Greece
Tel. +306974113652
Email: tg15042@uniwa.gr