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To : Dr Nikos Barkas, Democritus University of Thrace

Dear **Dr. Nikos Barkas,**

We would like to inform you that the manuscript entitled

Noise Pollution in Traditional Settlements of Tourist Interest: The Old Town of Xanthi

by **Katerina Katsanika, Georgia Ntouroupi, Nikos Barkas**

has been accepted for publication in the proceedings of the 1st Conference "ECHOPOLIS INTERNATIONAL- Days of Sound", which will appear by the end of 2015. All propositions have been subjected to a double- blind refereeing process.

The Editor

Dr Stella Kyvelou
Asst Professor, Dpt of Economics and Regional Development
Panteion University of Social and Political Sciences
Scientific Responsible of ECHOPOLIS INTERNATIONAL 2013

Noise Pollution in Traditional Settlements of Tourist Interest: The Old Town of Xanthi

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SUMMARY
The city of Xanthi has preserved the privilege, contrary to other Greek cities, to maintain substantially unchanged the district of the Old Town. Although, the initial Urban Plan (1939) provided massive building demolitions along with the construction of new streets, and despite the local reactions, the Old Town area was declared as preserved settlement (1976) thereby retaining the majority of its traditional buildings. It was not until recently, that the Municipality of Xanthi announced the partial pedestrianization of certain main roads in the district, where residential uses and amusement centers coexist, in a futile attempt to regulate the opposing targets between the local residents and the entrepreneurs of the region (safe access, parking, tranquility, outdoor serving facilities).
The paper is based on a systematic acoustic survey (February / June 2012) aiming to record the noise environment of the Old Town district in terms of sound level and acoustic characteristics. The acoustic survey included a full range of sound measurements (at selected locations and various time intervals) accompanied by detailed records of density / dispersion of leisure entertainments and traffic. The last part of the research comprised of an opinion survey conducted by a questionnaire circulated among residents, shopkeepers and frequent customers of the stores.
According to the results of the study, the periodic pedestrianization is not an essential issue concerning the management of a mild housing development in Old Town. An effective urban planning should be based on the control of noise pollution aiming at the maintenance of residential uses in the old district, along with the adoption of a prudent policy to attract private investment in the region.

INTRODUCTION
The first construction period of the Old Town of Xanthi is placed between 1830 and 1845, following the devastating earthquakes of 1829. [1] The development of the city was promoted by taxes and administrative privileges granted by the Ottoman Empire to various national minorities; at the same time, the interest of several European countries to develop new market op-

portunities in Thrace contributed to the development of the area. [2] As a result of the mono-culture of tobacco and the commercialization of its processing, the city of Xanthi rapidly became an international commercial center. [2 – 3, p105]

During a second period of development (1870 – 1910), Xanthi evolved into the administrative center of the region. The economic growth was further enhanced by the construction of the railway line Thessaloniki – Istanbul (1891) and massive construction of schools, churches and houses followed. [3–4] The commercial and the administrative services were gathered in the region of the Old Town, along with the public buildings, the urban residences and the mansions of Greek merchants, which were in complete distinction from the districts inhabited by the tobacco workers, the industrial area of tobacco warehouses, the Muslim and the Bulgarian community. [4]

After the Balkan wars, the development of the city was temporarily paused, along with the withdrawal of the Turkish administration (1912). [3, p215] However, the advent of Greek refugees from the Asia Minor as well as the gradual prevalence of international tobacco companies contributed to the increase in the agricultural production, thus converting the town of Xanthi into an international processing center of the homonymous oriental tobacco cigarettes. [2–3, p228] The consequences of the global economic crisis followed by the Second World War soon afterwards, the Bulgarian occupation (1941-1944) and the civil war (1946-1949) led Xanthi to economic and demographic decline. [3, p215–216] Moreover, the Old Town of Xanthi was affected by the massive immigration of tobacco workers and merchants to other Greek cities. [2, 4]

Since then, the district remained essentially unchanged, despite the massive building demolitions and the construction of new streets included in the initial Urban Plan (1939). The declaration of the Old Town of Xanthi as a preserved settlement (1976), the suspense of new planning permissions (1991) and the institutionalization of increased building protection measures (1993) ensured the preservation of a compact urban net with a high number of traditional buildings. [2–3, p217]

In the summer of 2011, the municipality of Xanthi planned, without any serious technical study, the partial pedestrianization of certain main streets in the Old Town district (where residences and amusement centers coexist), taking into consideration the difficulties and the risk of the road traffic due to the expansion of summer outdoor serving facilities. Finally, the project was cancelled due to the reactions of the local residents, and the disagreements expressed by local and scientific institutions. [5]

RESEARCH METHODOLOGY

This paper is based on a systematic acoustic survey conducted in the streets of the Old Town of Xanthi in order to investigate the sound level and the acoustic characteristics of the nuisance in the district.

The acoustic research included sound measurements at selected locations in the area of the Old Town (where residences are adjacent to restaurants, cafeterias and tourist stores), evaluation of traffic volume (records of the quantity and type of vehicles) during quiet hours, along with an opinion survey conducted to neighbors, shopkeepers and frequent customers of the stores. The data collection took place during the last Carnival weekend and successive weekdays and weekends throughout the entire period of February and June 2012, at specific positions, allocated on the main net of the Old Town as follows: 1. intersection Filippou Amoiridi – Maletsidou, 2. intersection F. Amoiridi – Mavromichali (Town Hall), 3. intersection Orpheus – Antique (Municipal Gallery), 4. Cathedral square, 5. intersection Filippou – Pygmalionos Christidi, 6. intersection Orpheus – Sgourou (figure 1).

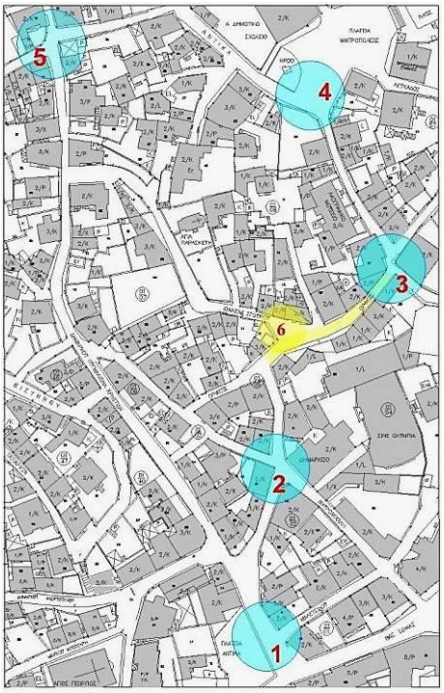


Figure 1

At positions 1 to 5, two (2) sets of sound measurements (during midday and night hours) were conducted for nine (9) days. Each set was repeated three (3) times within 20 minutes (duration 30 seconds), during which the maximum sound pressure level (max SPL in dB) and the hour equivalent sound level (Leq in dBA) were recorded by means of a sound - level meter type 1. The number and the type of the passing vehicles per hour were recorded at position 6, during the last week of March, twice a day, during midday and night hours (figure 1).

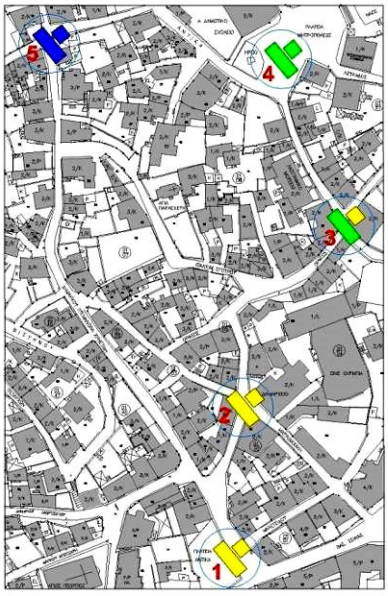
Additionally, a collection of opinions was conducted among neighbors, shopkeepers and frequent customers of the stores of the Old City (June 2012). The questions posed aimed at investigating their estimation about the noise disturbance during quiet hours, the distinction among different

sources of nuisance, the most noisy day of the week, the seasonal noise disturbance and their usual way of access to the Old City.
The results of this study are depicted in tables, graphs and noise maps.

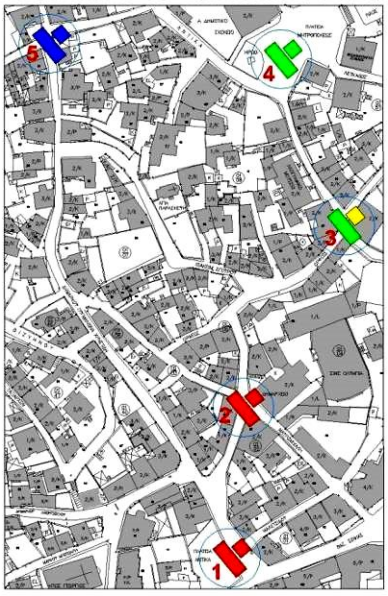
DATA RESEARCH

According to the data, traffic noise, outdoor gatherings and music emissions from the entertainment centers were the main sources of noise pollution in the Old Town area. Problems mainly resulted from the operating hours of the shops, especially on Fridays and Saturdays (until late in the evening or even early morning hours), and less from the emissions of music (because of the absence of outdoor loud speakers). Noise disturbance is more intense during summer time, when tables and chairs are placed in open and semi-open spaces, along with the open doors and windows of the shops. Moreover, the absence of any official controls of the operating conditions is evident, which matters worse.
The results of the sound measurements are presented in noise maps. Generally, the recorded noise levels ranged from 48,4 dB to 92,0 dB in terms of Leq (rectangular shape indications) and from 49,6 dB to 97,0 dB in terms of max SPL (square shape indications). According to these rates, the individual recorded levels of the sample received the following color (as shown on maps, at the various measurement positions): 48 – 58 dB blue, 58 – 68 dB green, 68 – 78 dB yellow, 78 – 88 dB orange and 88 – 98 dB red.

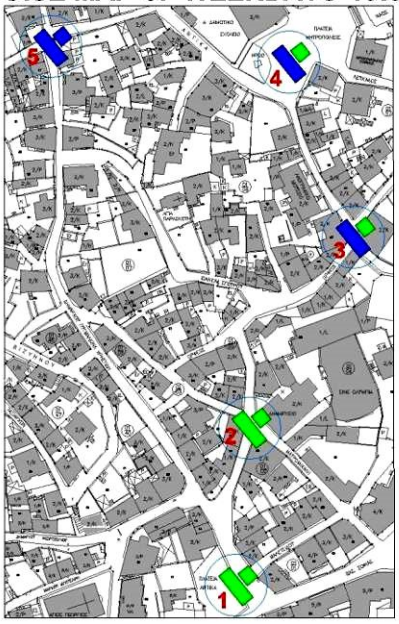
NOISE MAP 1: CARNIVAL 13:00



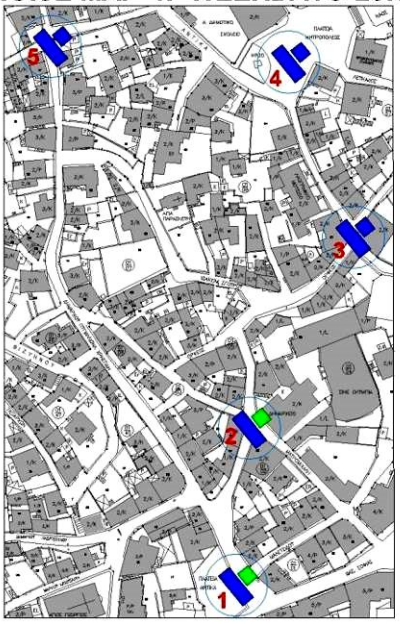
NOISE MAP 2: CARNIVAL 23:00



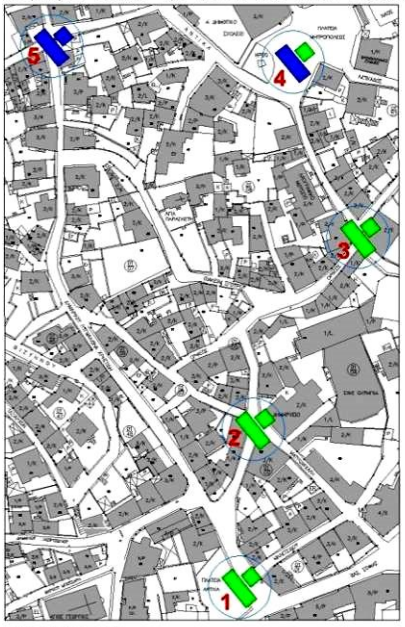
NOISE MAP 3: WEEKDAYS 13:00



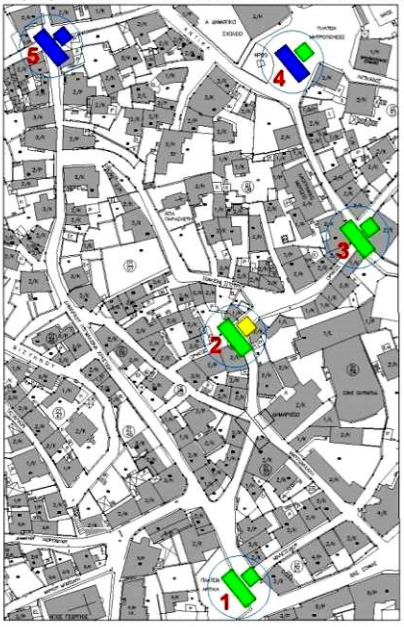
NOISE MAP 4: WEEKDAYS 23:00



NOISE MAP 5: WEEKEND 13:00



NOISE MAP 6: WEEKEND 23:00



LEGEND

48 - 58 dB | 58 - 68 dB | 68 - 78 dB | 78 - 88 dB | 88 - 98 dB

Leq | max SPL

The **maps 1 and 2** present the recorded midday and night-time noise levels in groups (max SPL, Leq) at the five (5) sound measurements positions, during the Carnival weekend (25 - 02/27/2012). High indications (max SPL > 88 dB) were recorded only at night, at the positions 1 and 2, while in all other cases the sound levels of the sample were much lower (max SPL < 78 dB, Leq < 68 dB). During midday, disturbance levels progressively decreased from position 1 to position 3. In particular, the remote location 5 was maintained at low disturbance levels (midday – night-time measurements).

The **maps 3 and 4** display the recorded midday and night-time noise levels (max SPL, Leq) in groups, at the five (5) measurements positions during the weekdays of the next week (Monday, Tuesday, Wednesday and Thursday, 27/2 - 1/3/2012). The midday rates were found to be higher compared to the night-time ones, especially at positions 1 and 2. At the other positions the hour equivalent noise levels (Leq) ranged between 48 and 58 dB, with a relative increase in the maximum SPL (58-68 dB) during midday measurements at positions 3 and 4. Noise disturbance at position 5 remained consistently low.

The **maps 5 and 6** illustrate the recorded midday and night-time noise levels (max SPL, Leq) in groups at the five (5) measurement locations on Friday and Saturday of the following week (2 - 3/3/2012). It should be pointed out that, contrary to the previous maps, the midday and night-time rates (Leq) of each position did not differ. Higher midday sound levels were recorded at positions 1, 2 and 3 (due to increased traffic volume caused by vans, private cars and motorbikes), while the highest night-time sound levels were registered at position 2, because of the customers' gatherings outside the stores.

At positions 4 and 5 (exclusive residential uses), particularly, the night-time noise levels were retained relatively low (max Leq = 57dB) during weekdays, presenting a relative increase (max SPL = 62 dB) on Friday and Saturday, due to instant disturbances, produced either by passing or parking cars.

The **charts 1 and 2** briefly display the variance between the midday and night Leq respectively, at the different positions of the sample during the week. The stability of the midday disturbance at positions 1 and 2, during the whole week, was a clear indication of the gravity of the midday noise pollution, regardless of the carnival time. On the contrary, the rates of the night-time noise at positions 1 and 2, defined the three days of the Carnival as the most aggravating sound period of the district of the Old Town.

Moreover, the general precedence of the midday sound disturbance was confirmed by the numbers of the traffic per hour (motorbikes, cars, vans) at

position (6), as presented in **charts 3 and 4**. On Saturday, in particular, twice midday transits of motorcycles were recorded, compared to other days, due to the increased visits of customers to the cafeterias and taverns of the district. On the other hand, it was observed that the night traffic, regarding private cars, was less than the half of the midday hours and close to zero related to vans.

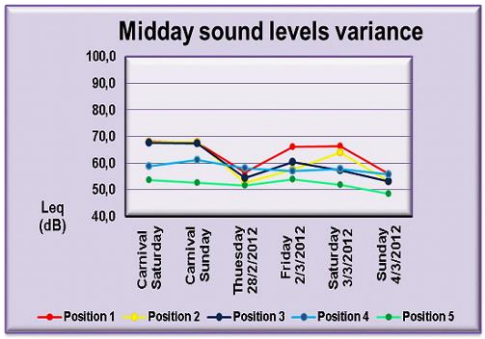


Chart 1

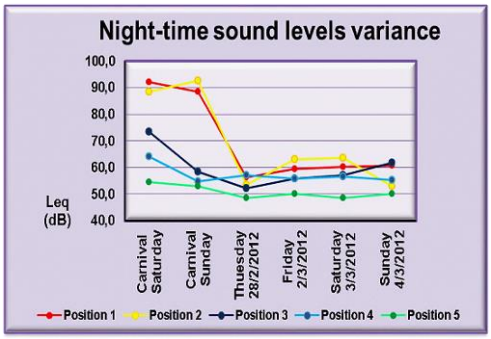
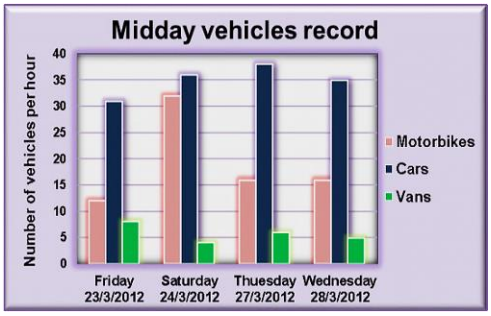


Chart 2



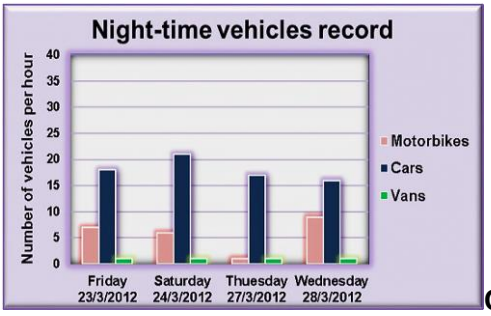


Chart 3

Chart 4

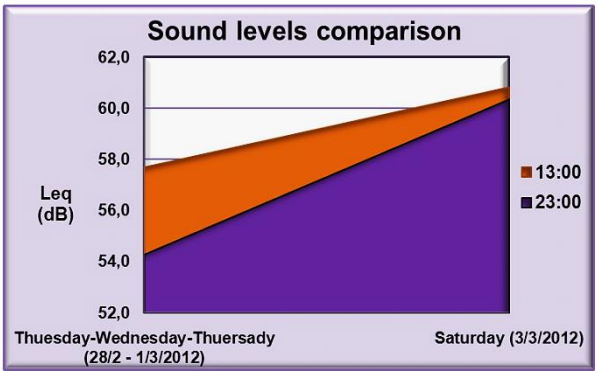


Chart 5 verifies the supremacy of the midday disturbance, presenting as well

the increased Saturday noise pollution, in relation to the weekdays, where the differences between midday and night-time rates were more balanced.

Chart 5

According to the data derived from the questionnaires, the residents of the Old City disagreed with the proposed pedestrianization. On the contrary, the entrepreneurs and frequent customers of the stores were in favor **(chart 6)**. As shown in **charts 7, 8 and 9,** the participant residents, usually found at their home during the quiet hours, were mostly annoyed in the summer, primarily by the traffic and secondly by the outdoor gatherings and music emissions. Finally, it was revealed that the Carnival (like the autumn festival of the Old Town) was not considered to be a memorable period of noise pollution, because they are regarded as commemorative activities, part of the landscape installation and means of the city's promotion.

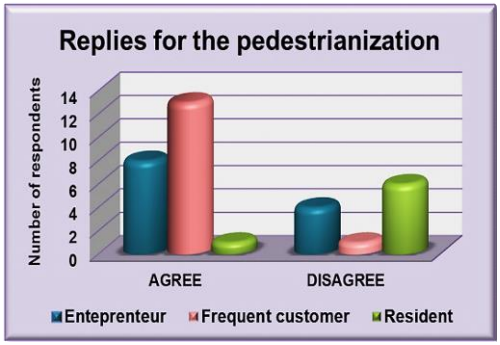


Chart 6

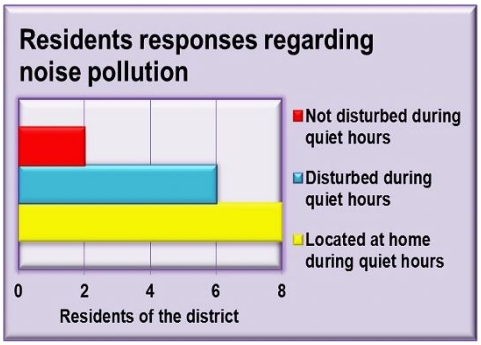


Chart 7

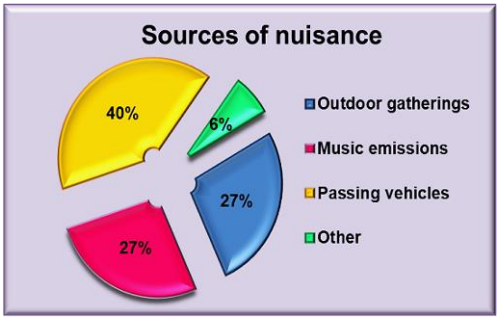


Chart 8

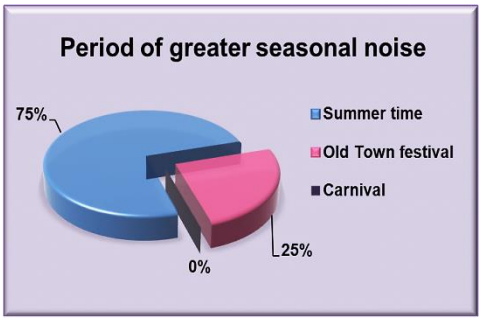


Chart 9

CONCLUSIONS

According to the results of this study, the noise pollution during the measurements days did not exceed 72 dB (max SPL), regardless of the

time and the position of the measurement (with the exception of the Carnival days), which was not unusual as a fact for such a provincial town. Nevertheless, the operation of amusement centers in the district of the Old Town cannot guarantee the maximum limit disturbance (35dB [A]) to the residences which belong to their proximity during midday and night-time.

By and large, the midday disturbance was higher than the night-time one, resulting from the stores supply, the circulation of the residents' vehicles and the operation of public services (City Hall, Cathedral, school, nursery school) during the weekdays. Higher levels of night noise pollution were recorded on Friday and Saturday due to the outdoor gatherings, the music emissions and the pedestrian circulation.

Initially, the higher rates of the midday noise than the night could possibly lead to the conclusion that a pedestrianization would contribute to the solution of the traffic noise. Nevertheless, the recording of the subjective aspects of the residents revealed that the pedestrianization, as a sole measure, would cause greater problems, since the residents would still have to endure the night disturbances, caused by the outdoor gatherings at the stores, and the lack of parking areas. Overall, the plan of the partial, periodic or permanent pedestrianization of the Old Town of Xanthi was proved to be ambiguous and pointless in terms of a more sustainable and prudent management of the future of the district: the residents approved of the free circulation of their vehicles, while, on the other hand, the customers and the entrepreneurs supported the pedestrianization in order to expand the outdoor serving facilities.

Consequently, it is considered appropriate to ensure the acoustic comfort of the local residents by means of a direct, medium-term and strategic planning, which would:

– address the traffic - parking problem and the dispersion of shops in the district,

– balance the institutional deficiencies with local regulations, severe surveillance of the operating conditions of the stores and improvement of the traffic net in the surrounding area,

– adopt a prudent anti-noise policy, towards the interest of the residents and the visitors of the Old Town.

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