MAPPING OF ELECTROSMOG EFFECTS IN URBANISED ENVIRONMENT

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Abstract
Physical, biological, and chemical conditions determine the evolution in Earth. As societies have evolved, the equilibrium previously realized has shifted, so today evolution is taking place under new conditions. The study of changes in the terrestrial environment has a significant impact on the electric and / or magnetic fields induced by societies, which are commonly known as electrosmog. In this present work, a model system for mapping electrosmog effects was developed, and a database for this was started to build.

Introduction
The conditions of evolution (physical, chemical, biological factors) determined the formation, operation and survival of terrestrial systems. With the presence of societies, natural conditions, that is, the terrestrial environment, have been transformed, altering its network of relationships [1, 2]. Accordingly, evolution is nowadays defined by new environmental conditions, and societal devices generating electromagnetic fields are also significantly involved in this relationship [3]. The biological matter pattern, so the life is evolved with the constant presence of natural background radiation. Natural (non-human) electromagnetic radiation is thus an integral part of our lives. Natural background radiation of Earth (under which Earth's life has evolved) has been modified by anthropogenic activities, and the resulting increase in electromagnetic energy is treated as electrosmog [4]. The electromagnetic fields and energy emitted by electrical equipment, due to the properties of living systems, have a behavioural effect on living organisms. In 1996, the World Health Organization (WHO) set up the International Electromagnetic Field Project to examine the potential health risks associated with electromagnetic field emission technologies [5]. The WHO team of experts has recently described the health implications of electromagnetic field (EMF) spaces in a summary article. Most power grids operate at 50 or 60 cycles per second, or hertz (Hz). The magnetic field value of some devices may be as high as a few thousand microteslas [6].

Aims
In this work we wanted to study the significance of electromagnetic fields (EMFs) in relation to ground conditions, which act as physical environmental loads. For dose-response studies, we also considered the processing of statistical research and on-site EMF measurement data documented by our team.

Methods
In this work, a structured nameplate of model household electrical appliances was constructed using Central Statistics Office (KSH) data. We have identified equipment that generates electromagnetic fields. Load levels are assigned in this data structure. In this way, the volume of indoor electric field transmitted by the on-mode presence of the respective household

appliances, appliances and fittings can be properly tracked. In these measurements, the electric field strength and magnetic induction emitted at different distances (0 m, 0.25 m, 0.5 m, 1 m, 2 m) were measured by the electrical equipment involved in the design of the model households, which is present in all households. In this way we can follow the decrease of the field strength with distance. For indoor measurements, the measurement points are designed so that they are located along busy areas of the population. The main reason for this is that our study was also targeted at society and the exposure effect it had on it. In addition, characteristic points that are outstanding in terms of exposure (eg. transformer station, high voltage column) were selected. In our field measurements, we used the ME 3951A handheld meter to measure low frequency (50 Hz-400kHz) field strengths in the range 0-1999 V / m.

Results and discussion

Model households were developed according to the load levels and are shown in Table 1.

1st level	**2nd level**	**3rd level**	**4th level**
washing machine	washing machine	washing machine	washing machine
television	television	television	television
refrigerator	refrigerator	refrigerator	refrigerator
landline phone	landline phone	landline phone	landline phone
traditional reading lamp	traditional reading lamp	traditional reading lamp	reading lamp with halogen bulb
	microwave oven	microwave oven	microwave oven
	kettle	kettle	kettle
	extension cord	extension cord	extension cord
		cell phone	cell phone
		computer (internet, router)	computer (internet, router)
			air conditioner

Table 1. Load levels of model households by working household appliances

The following table presents the timeframe EMF data for our model households from the Southern Great Plain region. The design criterion for model households was to adequately represent the evolution of EMF exposures in relation to household development. Below is a summary of the electric field strength emitted by each household appliance, followed by the summed exposure of model households.

	Field strength (V/m)	**Frequency-weighted field strength (V/m)**		
		2004	2011	2012
Numbers of households		175974	181889	192556
Numbers of cell phones	12.9	17.62	22.11	22.03
Computer (internet+ modem/router)	965.64	241.41	612.87	655.87
Washing mashine	2.92	3.17	3.02	3.03
Microwave oven	17.04	10.91	14.00	14.38
Television	158,.1	224.66	261.80	268.17
Refrigerator	1.99	2.05	2.07	2.05

Air conditioner	64	3.20	2.51	2.35
Landline phone	9.9	5.67	4.58	3.10
Traditional reading lamp	136	435.2	380.8	272.0
Kettle	50	10.0	40.0	65.0
Extension cord	150	375.0	420.0	525.0
Reading lamp with halogen bulb	390	468.0	780.0	1326.0
1st level		670.75	652.27	548.35
2nd level		1060.6	1319.14	1152.73
3rd level		1325.69	1761.25	183.63
4th level		1361.69	2162.96	3093.98

Table 2 Measured electric field strength of household appliances (E = V / m), weighted by frequency, in Csongrad County

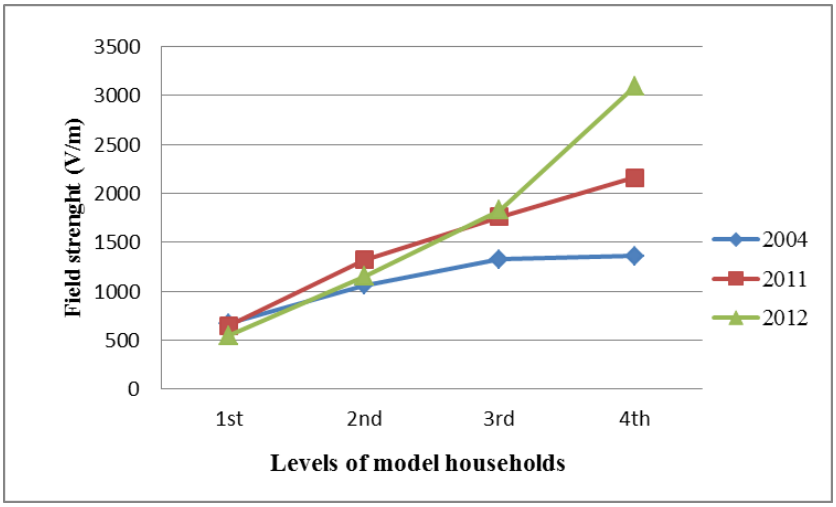

Figure 1. Tracking the increase in electromagnetic exposure through model households in Csongrad County

The figure above shows the value of the total field strength measured by the levels of the model household we have created, according to the years we examined in Csongrad County. The X-axis shows the load levels created, which are shown in ascending order. The Y-axis shows the electric field strength values that we have calculated or calculated from statistical data.

Serial number	*County*	*Denomination*	*Eastern longitude*	*North latitude*	*E (V/m)*
69	Csongrád	Road of number 4421 between Hódmezővásárhely and Békéssamson	20.3925	46.410278	>1999
109	Csongrád	Szeged, József Attila boulevard	20.156667	46.268889	1392,0

Table 3. Outstanding points of outdoor measurements in Csongrád County based on GPS coordinates

The measuring limit (1999 V / m) was reached by the test instrument at the high-voltage column shown in road of number 4421, which is adjacent to arable land. Another outstanding value was Szeged, József Attila boulevard point near the transformer station. Outstanding values are shown in the table.

Conclusion

In our conclusions, we find it very important that members of society are aware of the sources of exposure that they may encounter in their daily lives. The society should be aware of the positive and negative effects of the exposures involved, such as the nature of the environmental electrosmog, its source and its causal potential. In order to verify the real presence of EMF effects, we have developed indoor and outdoor measurement procedures and started building a real database.

Acknowledgement

EFOP-3.4.3-16-2016-00014, EFOP-3.6.1-16-2016-00008, TÁMOP-4.2.4.A/2-11/1-2012-0001

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