ISSN 2052-0018 (print), ISSN 2053-3667 (online)
Geographical Locality Studies 2014 Volume 2, Number 1. pp. 230–261

L Á S Z L Ó B O K O R
MSc, Geography researcher and teacher
PhD Aspirant at the Doctoral School of Earth Sciences at the University of Pécs
Proprietor of Frugeo Geography Research Initiative
Learn Team Leader at Eco, Birmingham City University, Students' Union
laszlo.bokor@frugeo.co.uk

V I K T Ó R I A N E M E S
BSc, Geographer
Geography masters student at the University of Pécs, Faculty of Sciences, Institute of Geography
nevi0321@gamma.ttk.pte.hu

Locality, Sustainability and the Ways They may be Measured

Abstract

The authors in this article try to assemble specific geographical information about locality. Their aim is to identify and understand the key factors of a local entity that may eventually help to work out a simplified measuring method to analyse a certain locus (for example a house or a town or anything that has a certain size and distinctive boundaries) accurately and with rationality. To achieve promising results, their approach goes through defining classic terms like space and time, locality, sustainability and the combination of the two latter ones (sustainable locality). Also, in regards of their aim of measuring sustainability, the initial step of creating the Need Model and Geographical Locality Index is now made.

Key words

Sustainable locality; Spatio–temporal perspectives; Measuring locality and sustainability; Geographical Locality Index (GLI); The Need Model

1. Introduction

It has been a while since the lead-author of this article first started shedding thoughts about how to start researching and explaining the real meaning of locality to fellow geography researchers which, at first instance, sounds profoundly easy, but on the other hand it requires a lot of reading up. It is an even bigger challenge to research the history of certain terms and definitions which are part of our everyday lives which supposedly should be easy to describe. That was the main reason for the preparation of this paper that the single authorship has been upgraded into a two-researcher project. Obviously, in this case, the approach of the authors is linked to the term or definition of locality that can most widely be understood and explained by the specific fields of *Earth Sciences*; therefore, this paper is going to dip into deep water.

2. Aims of the study

In this paper, the sustainability of the geographical sphere (natural and social ones) is analysed which is the continuation of the research that started in 2013 and the main objective of that was first published in *GLS 1* entitled *"The Energy Resources and Their Importance in the Local Environment"* (BOKOR, L. 2013). In regards to deepening this understanding, first of all the meaning of space and time and their relationship with locality are discussed. In the main part of this paper, all of those are linked to sustainable locality and how they are or can be measured, and, therefore, how the results are or can be compared with each other.

3. Research methods

The research presented in this paper has been part of a longer process, it is still in its preliminary stage and its background is majorly based on secondary sources that come from journal papers and scientific articles published in specific books and online. The basic information, however, forms the basis of this evolving knowledge development as

the "borrowed" research results of other authors manifest in creating new approaches and methods. Therefore, this paper simply rejuvenates classic geographical terms and with that simplicity in it, it tries to bring many new thoughts and specific mechanisms to life. The primary researches, therefore, represent the establishment of a new measuring method, and its further development and testing by creating new concepts and techniques.

4. The science of space and time

When it comes to talking about geography (or more precisely *Earth Sciences*), its potential is obvious for us. It is known that everything that it involves may be researched through 'space'—as its major advantage is being a spatial discipline. In special cases and circumstances, however, the research requires a bit more than analysing the space. In this case, the researchers' horizons may be widened by involving the 'time' factor. Now it is surely known that geography is an evolving transdisciplinary perspective on spatial and temporal processes and events. The physical world appears to have these aspects, so the existence and nature of space and time (or space–time) is a central topic (MAUDLIN, T. 2012). According to COUCLELIS, H. (2005), the world represents the empirical perspective on the subject of space and time at geographical scales. Throughout history, humans have always had to deal with physical formations of certain sizes (dimensions) in space. For example, the land where humans live, the mountains, seas and rivers that surround them, and even, of course, the humans' personal living spaces, for example the country, the city, the street or the house itself. It is known by every individual the approximate dimensions of their 'personal universes' and the exact sizes of their closest living spaces, for example the house, the living room, the garden, the bin, the shoe size, etc.

The space, however, between two locations, for example two cities, or the shortest routes going around mountains, or a bridge to build over a river may be described and measured by time, as well. But this 'time' may not only be minutes and hours; it may also be thousands

and millions of years of faded (or buried) memories. The scientific field called *Geochronology*, in good association with *Geostratigraphy*, for example, is one of the ways to analyse the *Earth* in both space and time. *Earth Sciences* in a colloquial term, however, has got the same potential; therefore, any of these geo-scientific subjects may be used to measure locality by involving these factors.

5. Locality

At the initial step, it is worth taking a detailed look into an English dictionary (COLLINS, 1986) which defines locality as *"a neighbourhood or area"*, *"the site or scene of an event"*, and—which is probably the most important to us—*"the fact or condition of having a location or position in space"*. As a more geographical term, the word locality derives from the Latin "locus", meaning "place or area" (COLLINS, 1986). As phenomena and processes are allocated in space, locality is an eternal category (TÓTH, J. 2002). Regarding this information, locality may be a settlement (for example a city) where a certain number of people live. It is characterised by its natural/physical setting and the people who live in there. It is a spot that has a certain size (space) and a certain evolution (time). Locality may, therefore, also define areas of a lonesome mountain, a solitary tree, a flock of sheep or a car park, which all have the same conditions when geography comes to analyse their properties.

Locality, however, is not only a loose bit in this chain. It is pretty much part of the whole that can only be described by people at a certain space at a certain time. The city where they live, the house that they own, the people with whom they interact, is all part of the system and this certainty defines their locality. Stepping away from a person's specific space and time factors, locality may involve more than an individual or a group of people who somehow relate and are all connected to the same location. This gives a wider analytical possibility to locality as it itself is involving space and time and including the people who all give characteristics and standards to the place where they all live. It could be important in the development of a person's identity in the

sense that the place where people live—where as a result of locally distinctive (biogeographycal, physical, historical) characteristics of a unique, local culture is evolved—plays a main role to develop one's identity (LIGHT, A. – SMITH, M. J. 1998). Through locality, there are styles and types that may be discussed.

To understand and gain knowledge about a locality, it is not enough to get acquainted with the place where one lives, but should have a wider view on the surrounding. If one understands and knows a local area, the links and also the differences may be discovered between the distinct areas, thus it is easier to distinguish the different localities. It is obvious that there is interdependence between localities, but they are not necessarily equal. Domination, subordination, influence and power need to be analysed; that way, therefore, the locality's "place in the world" can be realised (including its identity). In a locality, time and place are also important as well as the history of each locality, the history of relations, and the role of different localities (as roles change identity). If these relations are seen, it can be understood how the local is affected by the global and how the local actions at a local level affect the global. Localities have responsibilities on other localities like urban people have effect on other people, for example at remote locations (MASSEY, D. 1993). This way it can be realised that without locality there is no globality which, in recent times, has become more important (TÓTH, J. 2002).

In this geographical context, the meaning of 'locality', however, has to be torn apart as its conceptuality may be described by physical and human factors. Geography itself bears this; therefore, locality has it too. For example, human settlements were mostly established on sites where the differently strengthened locus formed energy centres (potential of energies), and where vital resources were given (for example water). This evolutionary progression also affected the development of settlements, and the natural sphere had been transmitted into a geographical sphere. The locality characterises a certain space within the geographical sphere (BOKOR, L. 2013).

Figure 1 – Maribor, Slovenia
Photographed by BOKOR, L. (2009)

Figure 2 – Mukachevo, Ukraine
Photographed by BOKOR, L. (2009)

Figure 3 – Rijeka, Croatia
Photographed by BOKOR, L. (2010)

Figure 4 – Bled, Slovenia
Photographed by BOKOR, L. (2011)

As it is described above, the photographs on the previous pages visualise this explanation *(Figure 1–4)*. They make it obvious that there are no human factors without the physical ones. The two have to co-operate and to interact efficiently to form a human settlement: the physical conditions and resources make possible to build an entire living space on a certain type of ground where the human methods exploit nature's potential.

6. Sustainability

The closing sentence of the last paragraph stated that *"human methods exploit nature's potential".* In normal circumstances, the method should represent the process known as *positive feedback* which can maintain sustainability. In biological systems, sustainability means how to endure and remain diverse and productive. Nature inherently strives to be sustainable at all times which, in fact, may also be adapted to human conditions. This can be approached from different aspects and angles which only depend on how it relates to the human sphere.

The word "sustainability" was a highly appearing term in RACHEL CARSON's *Silent Spring* (CARSON, R. 1962), but, as a definition, it was composed for the first time in 1987 in the *Brundtland Report* which was drawn up by the *World Commission on Environment and Development*, created in 1983 by the *United Nations Assembly*. According to this report sustainability is *"development that meets the needs of the present without compromising the ability of future generations to meet their own needs"* (UN, 1987). This means enabling people, now and in the future, to achieve a satisfactory level of social and economic development whilst keeping their human and cultural heritages respecting the use of the *Earth's* resources in order to preserve the natural species and habitats.

According to the report, as such, in human relations, sustainability can be conceptually divided into three components:

- environmental sustainability,
- social sustainability, and
- economic sustainability.

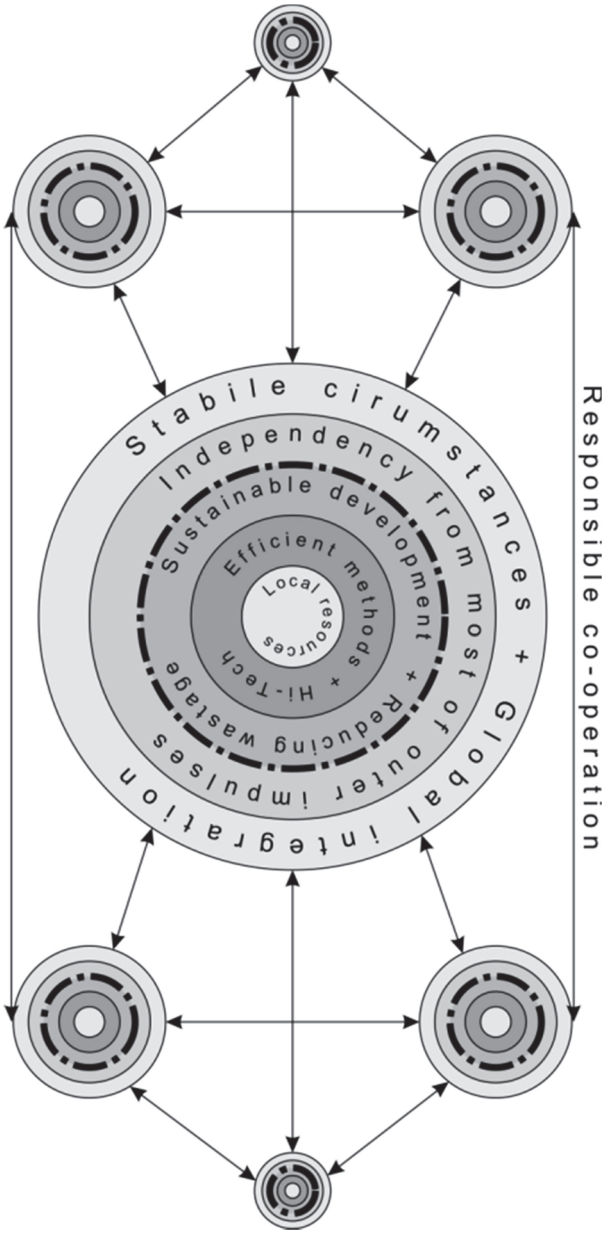

Figure 5 – The Sustainable Entity
Edited by Bokor, L. (2013)

The *Earth* is a system and everything is connected with each other: environment, society and economy form the backbone of human sphere which is, obviously, geographically based on the *Earth's* physical conditions. To live sustainably, humans need to be familiar with certain rules of the planet and apply them to everything that they do at home and at work. If these careful instructions are followed, the communities in the human sphere can work together towards sustainability. The different local communities, however, may co-operate and work towards a better environment and sustainable region. This is perfectly presented by *Figure 5*.

7. Sustainable locality

From a human perspective, sustainability for our planet means that it can carry on doing what it was designed to do: provide fresh air, clean water, produce food, and allow everybody to have a high quality of life. In this context, sustainability for a fully operational locus (for example to a city) means that things can keep going and sustain themselves. Locality comes into focus here, as the only sustainable settlement may be the one which is using its own resources and maintains the environment where it is situated. Those resources are available in the space occupied by the settlement and which may be essential to its entire evolution and development (in time), and, in general, to keep its population alive. Here sustainability and locality are now linked to a settlement's physical condition and available natural resources.

The pictures showed earlier do not necessarily represent settlements managed with sustainable care; they have, however, been kept in existence for centuries. According to THE GREENS's website on *Sustainable Settlements* (2013), there are certain conditions that make a settlement sustainable:

- it is designed and built to minimise environmental harm and maximise social well-being,
- it has a reduced ecological impact on the surrounding environment,

- the new urban developments are environmentally, sound, public transport friendly and facilitate community interactions,
- planning minimises urban sprawl.

At the moment, not many places in the globe may be as sustainable as the above list states. The size and location of the settlement may be a crucial part of this story. However, this requires investigations as there are farms and eco-villages that have the same size as some small villages, but the difference between them may be significant. This normally depends on the type of settlement as single farms and independent settlements may be fully sustainable whilst dormitory settlements depend on the surrounding cities and their resources. Huge urban places, however, have the biggest impact on humankind as— according to *UN*— the majority of the population is now living in cities (UN, 2012); therefore, in this sense, it is worth analysing the city environment of *Las Vegas* in the *United States of America*, as it is possibly one of the least environmentally friendly and sustainable localities on *Earth*. It is a famous tourist destination and it is also known or/and heard by millions of people around the planet; therefore, there cannot be a better example than this.

7.1. Las Vegas

Las Vegas is situated *(Figure 6)* within an arid basin on the floor of the *Mojave Desert*, surrounded by dry mountains. Much of the landscape is rocky and dusty; the environment is dominated by desert vegetation and some wildlife. The peaks surrounding the city reach elevations of over 3,000 metres (~10,000 feet), and act as barriers to the strong flow of moist air from the surrounding area. According to the UNITED STATES CENSUS BUREAU, the city has a total area of 351.77 km^2 (135.82 sq mi) with a population of 603,488 (2013 estimate; 2010 census 583,756). The 2010 population of the *Las Vegas metropolitan area* was 1,951,269. (And never mind the estimated 40 million tourists who visit the city every year.)

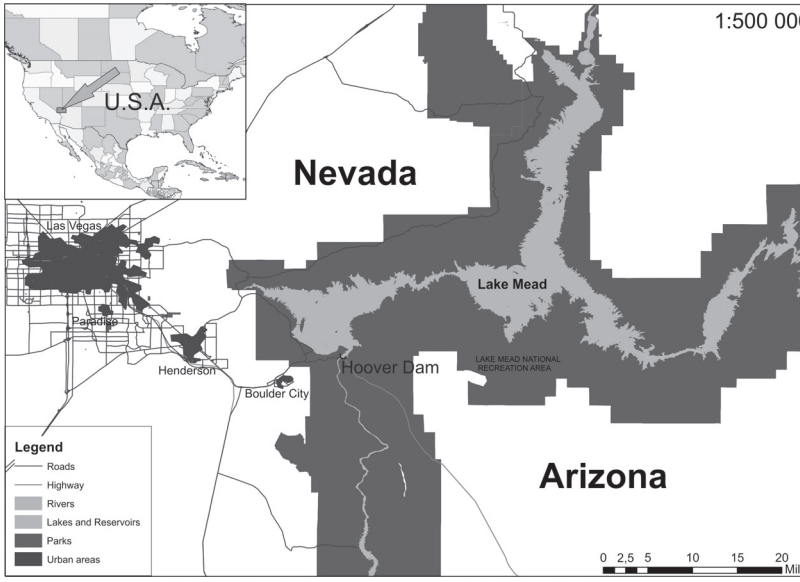

Figure 6 – The location of Las Vegas and its surroundings
Edited by SZELESI, T. (2014)

The *Las Vegas strip* (like the entire *Nevada*), home to the world's best known casinos where wastefulness is not just encouraged, but is a key part of the business model, is not only powered by the *Hoover Dam (Figure 7)*, but indirectly also by coal fired power stations (that are connected to the national grid *[Figure 8]*, but their locations may be anywhere in the *USA*).

The carbon dioxide emission of the city is huge. Since it lies in the middle of a desert, it is lacking in water resources, too. The water that is consumed comes from the *Colorado River* and the limited aquifers underneath the desert. The booming *Las Vegas Valley* and the *Reno–Sparks–Tahoe* area are bursting at the seams as new homes rapidly spill out into dry desert valleys. But cities cannot grow without water and energy resources. All in all, without even overanalysing the conditions, it can certainly be stated that *Las Vegas* and places similar

Figure 7 – Hoover Dam, USA
Photographed by SZELESI, T. (2014)

Figure 8 – Grid system from the Hoover Dam to Las Vegas, USA
Photographed by SZELESI, T. (2014)

Figure 9 – Las Vegas, USA
Photographed by SZELESI, T. (2014)

are the least environmentally friendly settlements that humans have ever designed, built and operated. And, unfortunately, many cities in the world are not in much better conditions, regarding their designs, inefficiency, ignorant and wasteful population *(Figure 9)*, and simply the fact that their resources are just not there where the settlement is located (see the fact associating with the energy resources). Therefore, a settlement like *Las Vegas* has its own, direct impact on the environment where it is situated, and it has a massive indirect effect on a much wider area which easily involves the entire middle part of the *USA*.

8. Large urban areas

According to *UN* prognostication, by 2050 an estimated 75% of the world's population will live in urban areas (UN, 2012). These urban areas are characterised by higher population density and vast human features in comparison to the areas surrounding it. According to their definitions, they may be cities, towns or conurbations, but the term is

not commonly extended to rural settlements such as villages and hamlets. However, cities present the world's population with the best chance of reducing our ecological footprint. Urban areas are uniquely positioned to lead the greening of the global economy through improvements in transport, energy, buildings, technology, water and waste systems, as well as producing a wide range of economic and social benefits.

9. Dormitory settlements (also known as commuter village or town)

It suggests that residents sleep in these neighbourhoods, but normally work elsewhere; they also suggest that these communities have little commercial or industrial activity beyond a small amount of retail, oriented toward serving the residents. This type of settlement is strongly associating with the surrounding settlements, especially with the major ones. Just to remind us of the *Las Vegas* example, for example *Boulder City* is one of the biggest dormitory settlements in *Nevada* which is about 32 km (20 miles) away from *Las Vegas*. It bears very similar physical characteristics to *Las Vegas*.

10. Small-scale eco-villages and urban food grow

Eco-villages are intentional communities whose goal is to become more socially, economically and ecologically sustainable. Most range from a population of 50 to 150 individuals. Their inhabitants are united by shared ecological, socio–economic and cultural–spiritual values. Concretely, they seek alternatives to ecologically destructive electrical, water, transportation and waste-treatment systems. Many see the breakdown of traditional forms of community, wasteful consumerist lifestyles, and the destruction of natural habitat, urban sprawl, factory farming and the over-reliance on fossil fuels as trends that must be changed to avert ecological disaster and create richer and more fulfilling ways of life.

Nowadays, eco gardening and growing food are becoming more popular in large urban spaces, too. In *Western Europe*, there are many examples from large cities—like *Berlin (Germany)*, *Vienna (Austria)*, *Birmingham (UK – Figure 10)*—where local residents, schools and universities try to reduce their ecological footprint by putting more effort to urban gardening and also turning towards a healthier lifestyle.

Figure 10 – Edible Eastside in Birmingham, UK
Photographed by Bokor, L. *(2014)*

10.1. Auroville and its integrated green practices

When it comes to eco-villages or urban greening projects, there is however effective approaches that grow at bigger scale. It is very important how a modern settlement is founded or established, or how far its roots go back in time. It is probably the possibility and opportunity to use all the benefits of the Hi-Tech whilst it is still combined with traditions. In this sense, *Auroville* is not only a settlement, but it represents the modern way of thinking. As their own statement says: *"It is a growing international township near Puducherry on the Coromandel Coast in India and is an inspiring model for sustainable practices and ecologically-responsible living. Founded in 1968, Auroville is based on*

the vision of The Mother from the Sri Aurobindo Ashram and is endorsed by UNESCO and Government of India as an ongoing experiment in human unity. Over the years, Auroville has won international acclaim for its efforts in social and environmental sustainability. In the early 1960s and 70s, a small group of pioneering residents took up extensive tree planting to rejuvenate the barren land and harvest rainwater. Since then, Aurovilians have been constantly experimenting with new ideas and solutions in areas of forestation, organic farming, renewable energy, water management, waste treatment, building technologies and environmental awareness programmes among others. One of the unique aspects of research in Auroville is the fact that many ideas are put into practice." (Figure 12)

Figure 12 – A sustainable locality as it is seen from Auroville
Source: AUROVILLE GREEN PRACTICES (N.A.)

11. The ways of measuring sustainability in a certain locus. The Need Model

Following the points above, when it comes to talking about *Las Vegas* and *Auroville*, there are highly noticeable differences between those two and, therefore, there are obvious differences between settlements in general. One absolute thing is, however, common: both of them are rooted in *Earth's* natural sphere, but the latter one uses its local resources and it represents a local community, whilst the other one uses resources from a much wider area which integrates the place with globalist perspectives *(Figure 13)*.

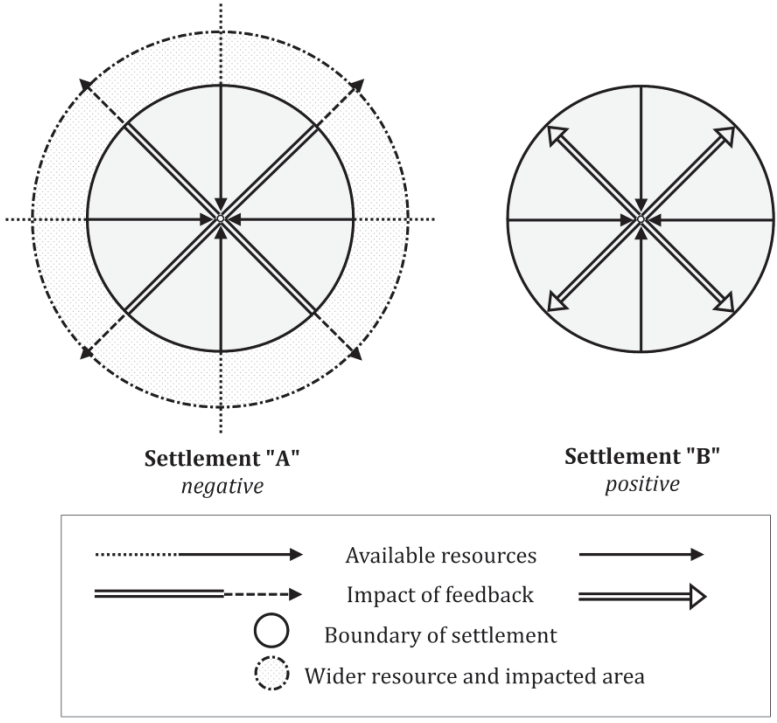

Figure 13 – Unsustainable ("A") and sustainable ("B") localities (e.g. settlements) depicted by the Need Model
Edited by Bokor, L. (2014)

In whatever way each of them is structured as human living space is the distortion of the social sphere, it is the distortion of the society. How can the real differences in sustainability be seen between those two? How could it be measured and mapped? Regarding this figure, the type "settlement" can be changed to any other kind of locality, because measuring a certain sustainability means that it is measured at a specific location, which again may be anything that have boundaries (for example a house, a garden, a car park).

When defining sustainability and measuring a certain locus, highlighting the difference between the words "need" and "want" is also essential. Using the COLLINS (1986) dictionary as a reference, "need" is most commonly defined as "to be in want of" whilst "want" is "to feel a need or longing for". Unfortunately, the dictionary uses two fundamentally different terms as almost synonyms. These words are also described as something "necessary", but the major difference between the two is that "need" is essential for life (for example water, air), whilst "want" is something that may be described as a treat, but not needed at all for life (for example beer, air freshener). *Figure 13* depicts *"the Need Model"* which describes this difference and may reflect on personal (individual) life habits and standards. This Model, therefore, may be used for further comparison and will hopefully contribute to the development of measuring locality.

… how to carry out the measuring?

There are the specific numerical parameters that provide a way to quantify and measure the abstract idea of "sustainability". Indicators provide a way to assess how the community looks right now in comparison to one another. When it comes to measuring a certain locus, the indicators have to be taken into account; however, the physical parameters have a greater role than any other components.

Having explained terms and definitions through these examples noted above *(from section 4 to 11)*, analysing the sustainability of a certain locality has its difficulties, and it is even more challenging to

define its rate of efficiency at one certain location. This section of the paper, however, tries to deal with this question and seeks solutions. The following hypothesis is now given: a certain location's sustainability regardless of its size can be measured and the same method can be used on other localities regardless of their sizes, too. In this article, therefore, a method is worked out and the major factors are taken into account only.

First of all, it has to be discovered that each locality in the geographical sphere is different; therefore, each of them would require a specific approach to be used. However, all of them rooted in the natural sphere what may allow to a certain method to be worked out to give a thorough analysis to each of them by involving the same geographical indicators or factors to be checked. So, it is a simplified method developed to use properties that may be found in every locality and these analytical parameters may form links to further calculations.This method is to analyse a certain locus which may be a garden, a house, a section of a street or streets, parts/districts of a settlement, but it may be used to analyse entire villages/towns/cities, counties, regions and even countries by amalgamating data of a needed number of analysed localities. It concentrates on the exploration of a locus's efficiency and sustainability, and highlights its physical potential and how these are exploited by the human population that live in that locality.

Sustainable locality measurement normally involves the sustainability of environmental, social and economic domains, both individually and in various combinations, but they are still evolving: they include indicators, benchmarks, audits, indexes and accounting, as well as assessment, appraisal and other reporting systems. They are applied over a wide range of spatial and temporal scales. In the sense of the above information, the following properties have to be thoroughly tailored to a certain locus to analyse its geographical parameters:

1. The potential of locality: physical properties,
2. The distorting effects of society: the human factors.

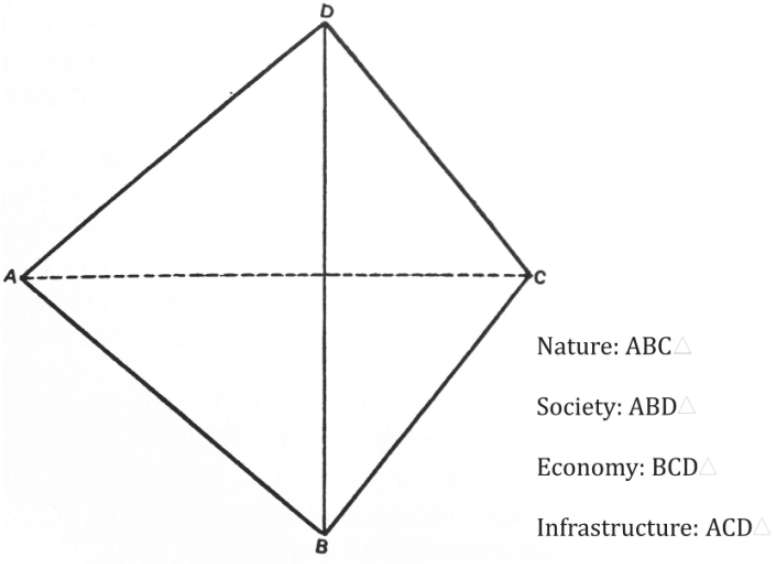

Figure 14 – The Tetrahedron Model
After TÓTH, J. (2002)

In a more combined way, the *Tetrahedron Model (Figure 14)* of TÓTH, J. (1981; 2002) may give more possibilities to analyse those parameters. The essence of the model is that the settlement is determined by four spheres: nature, society, economy and infrastructure which are in close connections with each other (ZSÓTÉR, B. 2008).

11.1. Physical properties

When it comes to analysing a certain location's physical conditions and given properties, the factors have to be checked in three dimensions:

1. Underground,
2. On surface,
3. Above surface.

The physical resources have to be checked within these three dimensions that eventually set up a realistic picture of the area; it gives an insight into the opportunities that may make the location sustaina-

ble in a measurable manner. Physical properties are often referred to as observables. They are not modal properties. For these the following factors have to be checked and their common values have to be compared and evaluated.

When a record is produced, the following topographical factors have to be taken into account and scored between 0 (not relevant at all), 2 (relevant) and 4 (very relevant), but the meaning of the scoring values depends on the factor taken into account *(Table 1)*.

Table 1 – The structure and observables of topographical properties
Designed and developed by BOKOR, L. (2014)

Properties	**Relevancy**														
	Below surface					**On Surface**					**Above Surface**				
Latitude, longitude and elevation	0	1	2	3	4	0	1	2	3	4	0	1	2	3	4
Orientation	0	1	2	3	4	0	1	2	3	4	0	1	2	3	4
Climate	0	1	2	3	4	0	1	2	3	4	0	1	2	3	4
Water resources	0	1	2	3	4	0	1	2	3	4	0	1	2	3	4
Sunshine	0	1	2	3	4	0	1	2	3	4	0	1	2	3	4
Wind	0	1	2	3	4	0	1	2	3	4	0	1	2	3	4
Volcanic activity (geothermal resources)	0	1	2	3	4	0	1	2	3	4	0	1	2	3	4
Minerals and rocks	0	1	2	3	4	0	1	2	3	4	0	1	2	3	4
Soil types	0	1	2	3	4	0	1	2	3	4	0	1	2	3	4
Vegetation	0	1	2	3	4	0	1	2	3	4	0	1	2	3	4
Animals	0	1	2	3	4	0	1	2	3	4	0	1	2	3	4

At this stage, weighing is not necessary to carry out a reliable analysis. They do not need to be rated, but the above scoring method may be worked out in the end (this would be the *Geographical Locality Index* or *GLI number*). This information will, however, be useful to compare localities and their given potential, but it will remain a subjective method, which is also descriptive, and it is based on observation and their evaluations. At this point, the second hypothesis may be stated:

the more physical properties (natural givens) are linked with one locus, the more sustainable potential it has or the more sustainable it can be.

The most effective way to test these hypotheses mentioned above is a classic, observational approach. This means that a physical geography map may be enough to identify sustainable potential and score a locus by taking the above factors into account. As the structure starts from the first onwards, it may become more complex and the points find their links and connections with the other factors in the group. For example, if a locus has a mountain range, its structure may indicate the presence of minerals, ores or other economically valuable resources (BOKOR, L. 2013); therefore, the research has to stick to the three observable dimensions *(Figure 15)*.

The generated index number *(GLI)* may be used to calculate and correlate a very simple amalgamation of data that allows the researcher to compare two or more locus with each other. This method (and the GLI number that the method generates in the end) is a combination of physical and human geographical factors/properties mentioned above; therefore, the old school research (structure) of regional geography has got a major role in here.

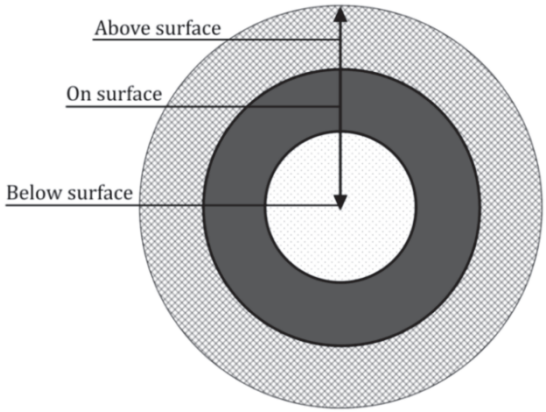

Figure 15 – Analytical dimensions of the physical properties
Edited by BOKOR, L. (2014)

All of this means that one number is produced by analysing physical and one number by analysing the human properties. In this sense, certain and given physical properties of a locus are correlated with each other. The more possibility is listed from a perspective, the higher the number is. This determines the given properties of a certain locality which means the higher the number is, the more sustainable opportunities the locus has. However, this number is distorted by the human factors which eventually determine a very simplified sustainability index of a location which can be measured by the *Need Model*. Clearly, two numbers produced: one which analyses the physical properties, and one which analyses the human distortion. The *GLI number* is the combined number of these two individual measurements.

11.2. Setting up a record

As it is mentioned earlier, the scoring values range between 0 (not relevant at all) and 4 (very relevant), but the meaning of them depends on the factor that is analysed. When the survey is carried out, 11 physical features are taken into account and are scored. These classic physical geographical factors are strongly connected with each other; therefore the scored relevance of one may affect the other.

The following 11 factors will be briefly explained by involving an example of a certain locus and a physical *GLI number (GLIp)* will be generated. When the survey is taken to gather data of physical factors, the human objects imaginarily have to be taken off and the analysed locus has to be seen without them. At this stage at the moment, the *GLI* only shows the sustainability of a certain natural locus. In fact, since it is a simplified index number, many places on *Earth* with organic formation and historical development should have the same or nearly the same physical *GLI (GLIp) number*.

The following example stands here to foster understanding to the three major factors:

a) latitude, longitude and elevation,
b) orientation, and
c) climate.

All of the other factors taken into analyse strongly associate with these three. According to WILHELM, Z. (2013), the exploitation of these forms a strong connection between nature (natural resources) and society:

d) water resources,
e) sunshine,
f) wind,
g) volcanic activity (geothermal resources),
h) minerals and rocks,
i) soil types,
j) vegetation, and
k) animals.

Sample location: 9730, *Kőszeg, Hungary*
GPS coordination 47°23'17.0"N, 16°32'33"E *(Main Square / Fő tér)*

Figure 16 – Kőszeg, town centre
Photographed by BOKOR, L. (2014)

11.2.1. Latitude, longitude and elevation

Longitude and latitude are numbers of a coordinate system that enables every location on the *Earth* to be specified. The elevation of a certain location is its height above or below a fixed reference point. It is strictly used when referring to points on the *Earth's* surface; therefore, the relevance of the underground and above surface might both be zero. But, the location of one particular city may be very important; regarding it is a seaside resort or an Alpine hut.

In regards of *Kőszeg*, the *Main Square* is at 273 m above sea level. In this sense, this information does not tell much to us, but seeing its certain GPS coordination, its exact location defined by latitude and longitude, it is known what external effects may have impact on it environment. *Kőszeg* lies in the conjunction point of mountains, rivers and plains which—in a temperate climate zone and at that elevation—indicates the best ground to establish a sustainably managed human living space. It is obvious that the scoring value will be the highest (4) in this case which is only checked in 1 dimension (on surface, the other two will both be zero).

11.2.2. Orientation

It is a location or position relative to the points of the compass. Its determination strongly associates with the elevation. It is very important when a house is built and where it is located. Orientation may help identify the position of a building with respect to the *Sun* which may have a key concept in building design. According to its relation to elevation, the relevance of the underground and above surface analyses might both be zero again.

In regards of the chosen example, *Kőszeg's* relation to its surrounding environment can be stated positive. It is located on the eastern side of the foothills of the *Alps* where, like a butterfly's wing, opens up a plain towards northeast from southeast, therefore, the place is protected from strong winds and heavy rain on the western side, whilst the Sunshine potentially reaches it which may be harnessed. This kind

of orientation is the best possible, therefore its score is the highest (4). According to the position of the locus, orientation is checked only in a dimension (on surface, the other two will both be zero).

11.2.3. Climate

Climate is a measure of the average pattern of variation in temperature, humidity, atmospheric pressure, wind, precipitation, atmospheric particle count and other meteorological variables in a given region over long periods of time. This is probably the most complex among the analysed factors that highly defines some of the individual ones that is used to create the *GLI number* (for example wind and sunshine).

Kőszeg's specific local conditions are highly affected be the climate. The question that has to be asked is how the climate affects sustainability? How efficiently does it support a local community? In no doubt it can be stated that the underground and above surface dimensions will be taken out of analysation, therefore both of them will be zero. To get the right scoring value, however, a deeper analyse is required on the local climate conditions and on its impacts to uncover basic facts of agriculture, farming and so on. Although, speculatively now it can be stated that the geographical coordination of *Kőszeg* indicate supportive climate conditions, therefore this value can be 4, as well.

11.2.4. Water resources

Surface water is water in a river, lake or fresh water wetland. Surface water is naturally replenished by precipitation and naturally lost through discharge to the oceans, evaporation, evapotranspiration and sub-surface seepage. But water is a form that can be found in all three dimensions; therefore, it is very important to analyse all of them.

11.2.5. Sunshine

Sunlight is a portion of the electromagnetic radiation given off by the *Sun*. An area receives direct irradiance from the *Sun* of at least 120 watts per square meter. The central star of our solar system is the

most important energy resource for the planets which is also the major factor to develop life on *Earth*. It has direct and indirect effects on most of the physical processes in nature. When it comes to analysing a certain locality, the factors directly affected by the *Sun* on the surface and above are taken into account only; therefore properties will not be analysed under the surface, so the score will be zero.

11.2.6. Wind

Wind is caused by differences in atmospheric pressure. When a difference in atmospheric pressure exists, air moves from the higher to the lower pressure area; therefore it has a direct effect on the environment above surface and a direct or indirect on the surface. It is important to take it into account as one of the most important natural forces that can be harnessed for its energy.

11.2.7. Volcanic activity (geothermal resources)

Different volcanic activities affect the area that is analysed. On the surface, direct volcanic activities can be seen in the form of volcanoes and post-volcanic activities (for example geyser, hot water basins). This activity strongly connected with the underground happenings. Volcanic activity may affect the atmosphere at a global level, but in this sense, it does not need to be taken into account when a certain locus is checked. The *Earth's* geothermal resources are strongly associating with volcanic activities, therefore, when a certain locus's resources are analysed, the under surface resources has to be scored too.

11.2.8. Minerals and rocks

A mineral is a naturally occurring substance that is solid and inorganic representable by a chemical formula. Rocks are majorly made of minerals. They together classify an area's sustainability through their availability underground and may have direct or indirect effects on the surface area. What only matters is their underground availability.

11.2.9. Soil types

A soil type, like the minerals and rocks underground, strongly impacts the surface environment and vice versa. According to minerals, soils form on different rock types, therefore minerals are strongly present in them. The major difference however, is that the soil types can only be taken into account to analyse at the surface level; therefore underground and above the surface will both be zero.

11.2.10. Vegetation

Vegetation assemblages of plant species and the ground cover that they provide. Their appearance and availability strongly depend on most of the factors mentioned above (for example minerals, soil type, climate conditions). Still, in this sense, only the surface is taken into account and it is analysed for the fact how they make the locality sustainable and how they contribute to its efficiency.

11.2.11. Animals

Again, the animal coverage of a certain area is strongly depend on most of the factors mentioned above, but this latter one involves the vegetation too as most of the animals depend on the food that is given by the environment. Animals indicate the same importance as the flora in general, thus how they make the locality sustainable and how they contribute to its efficiency.

12. Summary, conclusion and further researches

It is widely known that organic settlements were formed at specific locations where the potential of natural givens (e.g. water) met the human needs (e.g. drinking, farming). According to a land's basic physical properties (its geographical location, orientation and climate conditions), the sustainability of the human settlement that grows up on it will be strongly influenced and affected by a certain number of subfactors (the amount and quality of water that is available, the amount and length of sunshine, the strength of wind, the available geothermal

resources, minerals and rocks, soil types, vegetation and animals). All of these factors and their properties may be analysed by a specific—but straightforward and simple—method which allows comparing location with each other. One certain settlement's sustainability can be measured with this method. The simplicity of the *GLI number* helps us create a reference number which in fact, in regards to the human settlements with organic formation and historical development, will have the same or nearly the same physical properties, but the quality and amount of them will determine its further sustainability.

Obviously, the physical factors are distorted by the human society (social sphere) and this effect has to be taken into account to draw up an accurate picture (to work out an accurate *GLI number*) on a locus's sustainability. Processing this number, the Need Model may be employed to discover the distorting factors and their impact.

Carrying on working with *GLI number* is a great way to address challenges too. Any further research will have to concentrate on fine tuning the analysis of the properties taken into account. When the physical factors are clearly identified and the measuring method gives a reliable index number, the research has to deal with the distortion effects of the society. Nevertheless, this human world is the key factor to see a settlement's true face of sustainability.

References

BOKOR, L. (2013). *The Importance of Energy Resources in the Local Environment.* In: BOKOR, L. – CSAPÓ, J. – SZELESI, T. – WILHELM, Z. (eds.) *Locality and the Energy Resources.* Geographical Locality Studies 2013 Volume 1., Number 1. – Frugeo Geography Research Initiative, Shrewsbury, pp. 14–29.

CARSON, R. (1962). *Silent Spring*. – Houghton Mifflin, 378 p.

COLLINS (1986). *Collins Dictionary of the English Language – Second edition (HANKS, P. ed.).* – Collins, London & Glasgow, p. 901–902.

COUCLELIS, H. (2005). *Space, time, geography.* In: LONGLEY, P. A – GOODCHILD, M. F. – MAGUIRE, D. J. – RHIND, D. W. (eds.) *Geographical Information Systems: Principles, Techniques, Management and Applications, 2nd Edition, Abridged.* – Wiley, pp. 29–38.

LIGHT, A. – SMITH, M.J. (1998). *Philosophy and Geography III. Philosophies of Place.* – Rowan and Littlefield Publishers, INC., Maryland USA, pp. 24; 128–129.

MAUDLIN, T. (2012). *Philosophy of Physics: Space and Time.* – Princeton University Press, Princeton (USA)/Woodstock (UK), 183 p.

NEWMAN, P. – KENWORTHY, J. (1999). *Sustainability and Cities: Overcoming Automobile Dependence*. – Island Press, Washington, 447 p.

TÓTH, J. (1981). *A településhálózat és a környezet kölcsönhatásának néhány elméleti és gyakorlati kérdése.* – Földrajzi Értesítő Vol. 30, No. 2–3, pp. 267–292.

TÓTH, J. (2002). *Általános társadalomföldrajz* I. – Dialóg Campus, Budapest–Pécs, pp. 86–87.

WILHELM, Z. (2013). *Water as a Natural Resource, Cultural Heritage and Tourism Attraction in India.* In: BOKOR, L. – CSAPÓ, J. – SZELESI, T. – WILHELM, Z. (eds.) *Locality and the Energy Resources.* Geographical Locality Studies 2013 Volume 1., Number 1. – Frugeo Geography Research Initiative, Shrewsbury, p. 97.

ZSÓTÉR, B. (2008). *The Stud Farm, from its Establishment till 1920 – Introduction to the History of Mezőhegyes with the Tetrahedron-Model.* – Scientific Papaers Agriculture, Editura Agroprint, Banat's University of Agricultural Sciences and Veterinary Medicine Timisoara Faculty of Agriculture, Timisoara, Vol. 40, No.3, pp. 383–387.

Electronic sources

AUROVILLE GREEN PRACTICES (N.A.). *Integrated Green Practices*. Auroville Green Practices [Online]. Available at <http://www.green.aurovilleportal.org/> [Accessed: 29 April 2014]

MASSEY, D. (1993). *Questions of Locality.* – JStore [Online]. *(pdf)* Geography, Vol. 78, No. 2, pp. 142–149, Available at <http://www.jstor.org/stable/40572496> [Accessed: 21 September 2014]

THE GREENS (2013). *Sustainable Settlements 2013* [Online]. Available at <http://wa.greens.org.au/policies/sustainable-settlements> [Accessed: 11 October 2014]

UN (1987). *Our Common Future – Report of the World Commission on Environment and Development.* United Nations [Online]. *(pdf) 247* p. Available at <http://conspect.nl/pdf/Our_Common_Future-Brundtland_Report_1987.pdf> [Accessed: 02 October 2014]

UN (2012). *World Urbanization Prospects – The 2011 Revision.* United Nations [Online]. *(pdf)* Economic & Social Affairs, New York, 50 p. Available at <http://esa.un.org/unup/pdf/WUP2011_Highlights.pdf> [Accessed: 30 September 2014]

UNITED STATES CENSUS BUREAU (2014). *Las Vegas (city), Nevada.* [Online]. State and County QuickFacts. Available at <http://quickfacts.census.gov/qfd/states/32/3240000.html> [Accessed: 09 July 2014]