reviewed paper

Quality of Time Spent Matters!

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1 ABSTRACT

The paper discusses an innovative approach towards addressing and measuring quality of living environments. It introduces the model which talks about quality of living environments via quality of time spent in user's daily routine. It examines relationships between characteristic profiles, their activities and the environments they are involved in, analysing three key parameters: time balance, financial balance and time-quality balance. Time balance shows how comfortable the time is offered to the user by his/her living environments. Economic balance is a category which represents user's incomes and expenses for necessary and optional activities. It represents a financial frame within which the user is flexible to be able to perform its activity in a certain environment. Time-quality balance is the final measure of quality provided with the proposed model. It classifies time spent regarding the activity and the environment in which the activity is taking place as well or badly spent time. Time-quality is expressed by time-quality coefficient KTQ. The model shows whether a segment of population can live in certain area and how comfortable.

2 INTRODUCTION

A general standpoint of this paper is that quality of living of any society begins with the quality of living for individuals. Therefore, one must bear in mind that any intervention in the environment must serve its user(s) well. This also means that when aiming for some (new) development, it is necessary to know this user, his/her habits, expectations and most of all the abilities to achieve well-being and consume the offer of the area he/she lives in fully (Goličnik Marušić, 2011; Goličnik Marušić and Marušić, 2012). A specific standpoint of the paper is that it is crucial to achieve well-being especially via optimisation of consumption of time, optimisation of services and reduction of costs. The paper addresses a spatial interaction model which assesses quality of space for certain use (activity) and certain user (profile) via analysis of quality of time spent for that activity in a particular space or sequences of spaces. It is based on temporal evaluation of places and is able to assess effectiveness of human environments for living. The motive is how to come to real life in certain area, real people, real economic frames as well as spatial characteristics as close as possible, and set up a time-place oriented approach (Marušić and Goličnik Marušić, 2014). The challenge is in searching for the approach which may address quality of living quite directly and describe it with simple everyday measures which are shaping our daily routines and which reflect on actual living situations as much as possible.

Quality of living is reflected in a notion of quality of life (e.g. Allen and Gibson, 1987; Norris, 2001). Approaches for modelling quality of life have been developing for some decades (e.g. Albouy et al., 2013; Lora and Powell, 2011; Baker and Palmer, 2006; Blomquist, 2006; Gabriel and Roshental 2004). Literature review shows that although quality of life is recognised as a general concern, there is little consensus of a definition of quality of life or the factors/ predictors of an individual's quality of life (e.g. Bramston et al., 2002; Michalos, 2003). There is still a lack of focus on detailed, actual, local level aspects, despite of the fact that many strategic documents as fundamental objectives for smart, sustainable and inclusive growth put the importance of local development towards quality of place and well-being of people. However, actual implementation of such objectives into real life situations, in scale 1:1, is often vaguely realised.

The paper introduces the prototype of the model and shows how the model can work. It debates basic initial ideas and conceptualises the model for simulation and valuation of quality of living based on measures of quality of time spent at daily routines of representative profiles in selected environment. Key indicators to calculate possibility and comfort of living in the given environment are time balance, financial balance and time-quality balance.

3 CONCEPT

Many approaches for assessing or measuring quality of living aim for comprehensive concept of quality of life, referring to social, spatial and economic aspects (e.g. Diener and Suh, 1997). However, in finalisation focuses on some priority aspects and actual comprehensiveness are a bit lost. Also, none of them suggests any universal measure which can be equally applicable wherever. Our model suggests time as the universal expression and measure of quality of living.

The assumption is:

- Quality of time spent indicates quality of living environments.

Further assumption is:

- Quality of time spent depends on that what a person can afford.
- A common denominator for evaluation of quality of living environments is a measure of good/bad time.

This calls attention to introduction of time-distance units and time as a quantification of quality for basic measure in the model. The real issue is in examining and measuring a temporal distance; a consumption of time over certain distance between two places, defined by the means of transport and the type of way and regime applied upon it. Such idea is not new. However, this time issue in spatial planning has not been sufficiently transformed into wider frame, over the transportation studies, towards a measure for quality of living. The aim is to address quality of living via quality of time spent within peoples' daily routines.

Paying attention to users' daily routines in their environments as much as possible reflects a bottom-up approach. As a method and evaluation tool for quality of place in relation to its usage behavioural mapping is valid, where GIS behaviour maps extract behavioural evidence into layers of spatial information to give a better understanding of the individual and collective patterns of use that emerge in a place (e.g. Goličnik Marušić 2011; Goličnik Marušić and Marušić, 2012). Besides, to get as thorough insights about people and places as possible, field work analysis, focus groups interviews and analysis of publicly accessible databases as well as available planning documents are proposed to be analysed.

Model development process represents a set of necessary steps where the first are characteristic for their descriptive nature, while further and final steps are characteristic for the decision-making character. They are:

- Provision of adequate database (e.g. demographic, socio-economic data)
- Identification of the profile(s) (e.g. users)
- Definition of the scenario for each studied profile (e.g. minimal and optimal scenarios for each selected profile)
- Valuation of the location

3.1 Quality of space via quality of time spent

There is no absolute measure of quality of living space. Quality of one space may be defined in relation to another known or defined quality. Parameters of quality depend on purpose of space (urban amenities) and/or space user(s). Something that is important for one user may not be as important for another or may not apply for other user at all.

User's time spent in certain space is valuated as good (the best), bad (the worst), or something in between. Accordingly, satisfaction with time is valuated with scale from -100% satisfaction (complete dissatisfaction) to +100% satisfaction (complete satisfaction), where 0% satisfaction would mean that user is indifferent to time spent in certain space. In such valuation positively signed percentage of satisfaction is transformed into "good time"; negatively signed percentage into "bad time"; the rest is "indifferent time".

3.2 Schedules and users' characteristics

As the model aims to address real life situations as much as possible, the smallest possible unit must be defined for the scale studied. To be able to simulate behaviour of population, behaviour of individuals needs to be known. In this model behaviour is defined by three significant situations: daily routine, weekly routine and extraordinary routine. Those routines are described in relation to individual's needs, obligations and desires. In a personal level (e.g. home) control over the relationships between realised desires, needs and offer is manageable and liveable places in relations to wishes and expectations are often achieved. In bigger scales and more complex environments, where to achieve liveable environments, needs and expectations of many individuals are in question. The smallest common denominators about qualities of living environments must be found.

On the basis of individuals' profiles it is possible to define limits of population of the studied area and edge conditions of/for such population within the area. An average profile does not help to understand the population, its needs, expectations or obligations. It is necessary to define some characteristic individual profiles which can help to describe the population in the studied area. Such profiles are set up from available statistical data or any other relevant source (e.g. questionnaire) regarding demographic and social parameters such as: age, gender, family status, education, occupation, income, and the like. Based on crucial boundary characteristics all possible variations of individual profiles, which are assumed to be realistic, are defined. Realistic profiles are designed by logical filters or on the basis of known data about the population of the area of interest. Having defined possible real boundary profiles of the population, the assumption (for further development of the model) is, if those boundary profiles are satisfied, all profiles within the studied segment of population are covered.

To get as thorough insight as possible into a segment of population daily routines of boundary profiles are important. There are as many routines as there are boundary profiles. However, there can be less different routines as there are profiles, as some profiles can have the same daily routine.

3.3 Properties of place

There are two basic types of properties of places: programmes in places and communications between them. Necessary programmes are, for example, dwelling, working, attending to the basic services. Other activities within a daily routine are classified as optional or desired, such as leisure, recreation (e.g. sport, culture) and other services (e.g. hairdressing). Each such spatial component - programmes based in the building or in an open space and the communication between them - has its basic purpose. Places are evaluated against their prime purpose as well as to any other potential activity they might stimulate. Thus two components of the place are taken into consideration:

- what a person is doing in a place and,
- in what kind of environment the activity is taking place.

Both components are valuated with quality of time spent. Final suitability of the location for one ore more activities is valuated with quality of activity component of time (FQAC), i.e. quality of time involved in action as such, and quality of spatial component of time (FQSC), i.e. quality of time spent in a certain environment. There is a third parameter which links these two components of time (activity component FQAC, spatial component FQSC) by weight (FWAC, FWSC), i.e. how much of an influence has each of the components on quality of time spent in a place for this certain activity. This ponder depends on profile's preferences. Final results are measured in coefficient of time-quality and quality time balance (see KTQ and TQ in Table 1).

3.4 Time-people-place notion-base of the model

The assumption "quality of time spent indicates quality of living environments" can be paraphrased into: Less time spent for commuting (e.g. to work, to recreation or other services) and more time to have for any kind of leisure (e.g. theatre, recreation), better quality of life can a person live. What a person can afford depends on what is available and for what price. This is of course limited by person's budget. Nevertheless, budget is only the frame within which a person can manipulate his/her choices and appoint the amount of money for a desired activity. Proposed concepts and ideas are illustrated with two simple examples.

In the first example, there are two different valuations of the same time by two different recreational swimmers (S1, S2): Each of them pre pays time-tabled hour of swim (6 EUR). They are both running late for 5 minutes. S1 does not want to loose any minute of swimming and takes a taxi to the swimming pool. He arrives on time. S2 walks to the swimming pool along the nice neighbourhood and arrives 10 minutes late. As they both have to finish swimming at fixed time, S1 has been swimming for 60 minutes, S2 for 50 minutes. However, S2 considered his walk as valuable as swimming; so, S2 does not feel he lost 10 minutes of recreation. Moreover, S2 might even feel he gained 5 minutes of recreation. S2 did not spend any extra money. S1 completed his 60 minutes of recreation and spent some extra money for a taxi.

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To sum up, S1 paid 6 EUR for swimming pool and 6 EUR for a taxi to enjoy 60 minutes of swimming. The price was 12 EUR for 60 minutes of recreation. S2 spent money only for swimming pool. The price was 6 EUR for 65 minutes of recreation (50 minutes of swimming + 15 minutes for walking). They both spent 65 minutes for both activities commuting to the pool and swimming in the pool, but they were willing to pay different price for the same thing (swimming). S1 paid 12 EUR for 60 minutes of swimming (20 cents/ 1 min of swimming); S2 paid 6 EUR for 50 minutes of swimming (12 cents/ 1 min of swimming). Time spent in the swimming poll as well as time spent for commuting to the pool they valuated differently.

When addressing quality of living, quality of time spent for recreation matters. Let's illustrate further. Both persons earn the same per working hour (e.g. 12 EUR). As shown above, S1 had 60 minutes of good time (recreation), S2 had 65 minutes of good time (recreation). Speaking in time-dimensions, for these 60 minutes of good time, S1 consumed one working hour and 5 minutes of taxi driving, i.e. 65 minutes of bad time (time spent for working is considered as a bad time). S2 spent 65 minutes of good time and consumed for that only half working hour, i.e. 30 minutes of bad time. The value of and the price for time spent differ very much. S2 gets higher value for lower price.

In the second example, there are two persons (P1, P2) with different incomes who go for 60 minutes of swimming. There are three time corpuses which matters: time for swimming, time for going there, and time of work in which a person earns enough to be able to swim and go to swimming. P1 earns 72 EUR/h, P2 earns 12 EUR/h (P1earns 6xP2). Swimming hour costs 6 EUR. If P2 is walking to the swimming pool for 10 minutes and swimming for 60 minutes he/she must work for that commodity for 30 minutes, as the only cost is the entrance to the swimming pool (6 EUR). So, for 60 minutes of swimming (good time) P2 has to invest in total 40 minutes of commuting and working (bad time). If P2 takes a taxi to the swimming pool it costs 6 EUR and takes 5 minutes. In such case P2's time balance is as follows: for 60 minutes of swimming (good time), P2 invests 5 minutes of commuting and 60 minutes of work (30 minutes to pay a swimming pool and 30 minutes to pay a taxi). In total, for P2 the bad time (65 minutes) prevails the good time (60 minutes). So, to keep living good in the area P2 cannot afford to take a taxi to the swimming pool.

On the contrary, for 60 minutes of swimming and going there by foot, in time measures P1 spent 10 minutes for walking and 5 minutes of working hour for the entrance. So, for 60 minutes of a good time (swimming) P1 invests 15 minutes of bad time. In case that P1 takes a taxi, situation in terms of time-quality balance is the same: for 60 minutes of swimming P1 invests 5 minutes of commuting by a taxi and 10 minutes of work (5 minutes for paying a taxi, 6 EUR; 5 minutes for paying the swimming pool, 6 EUR). In the case of the person who earns more money (P1) the price in bad time for the unit of good time is the same in both arrangements. For such a profile it is irrelevant which way of transport to the swimming pool the person chose, while the other person makes his/her quality of living much worse. If chose to go by taxi the total balance is 5 minutes of bad time and 0 minutes of good time.

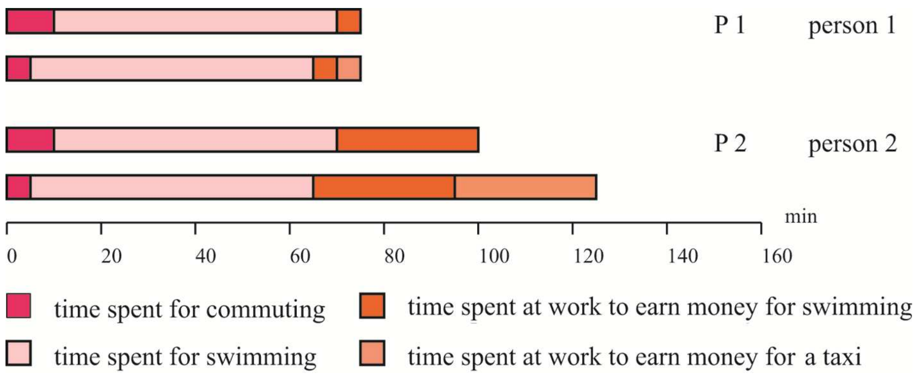

Fig. 1: Time spent for direct involvement in recreation related activities and time spent for investment in recreation related activities.

4 MODELLING: ITERATION PROCESS

Having behavioural patterns and peoples' daily routines in mind, the main points of departure for the modelling process reflect aspects grounded at the beginning of the paper:

- For quality of living, quality of consumption of time matters.
- Quality of living of a person reflects in how well he/she can spend and is spending his/her time.

- Various environments enable various quality of living, i.e. various quality of consumption of the available time.

Translating it into model iteration process there are three key analyses to be followed:

- time balance,
- financial balance and
- time-quality balance.

Time balance shows how a chosen routine is manageable for an individual in the available time. It shows if a person can achieve necessary and optional activities within an available limited time frame (e.g. 24 h/day). Financial balance shows if these selected activities can be afforded per person within a household. This is that incomes and expenses of a household per person enable these activities to be fulfilled. When financial situation allows the activities can happen, then time-quality balance shows how well the time needed for them has been spent in total; i.e. how much of the entire time taken for all the activities per day is considered as being good quality and how much of bad quality. This balance shows final quality of time spent within a routine and reflects on quality of living environment one lives. The sections below show some examples.

4.1 Time balance

Time spent for each action should be shorter or equal to available time for that action:

$$T_{Rqi} \le T_{Avi}$$

where

TRqi = time required for action i

TAvi = time available for action i

Sometimes one does not manage that, so the person is late. However, the minimum required condition, jet not always sufficient, is to do everything that is required in the whole available time (e.g. to do all daily routines in 24 hours):

$$\sum_i T_{Rqi} \le \sum_i T_{Avi} \rightarrow T_{Rq} \le T_{Av}$$

Time balance analysis shows balance of necessary and optional activities. The assumption is if the profile is not able to fulfil necessary activities, the neighbourhood is not suitable for such profile. If the profile is not able to fulfil optional activities, optional activities must be re-organised against a new priority list.

4.2 Financial balance

When discussing financial balance, the basic information addressed is household's incomes and expenses for necessary activities and optional activities. Expenses of a household should not exceed the incomes:

$$\sum_i M_{Rqi} \le \sum_j M_{Avj} \rightarrow M_{Rq} \le M_{Av}$$

where

M_{Rqi} = money required for expense *i*

M_{Avi} = money available from the source *j*

Accordingly, incomes are classified as regular (e.g. salary earned in working time every working day); other regular (e.g. pension, rent); and irregular (e.g. property selling). If the model assesses suitability of location for permanent living, then certain location suits its user if this user manages to live at the location with the regular incomes. This means that for his/her permanent living at the location, the person should not use any savings. Final important information is how much money is left after all necessary expenses and what a representative of the profile can do for that money.

Expenses are classified as residential expenses; basic basket expenses (e.g. food, clothes); other necessary expenses (e.g. nursery, school); other optional expenses; and travel expenses for commuting at daily routine. Residential expenses depend on location, but vary at the location regarding the profile. This means that more levels can be recognised, e.g. basic, medium, and high. Similarly, basic basket expenses can vary regarding the prices different individuals are willing to pay for basic goods. Choosing medium or high level may

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represent optional expenses for residential expenses and expenses for basic goods. Savings are usually also important component of financial security of household and consequently influence satisfaction. Therefore the ability of household to make some savings in given environment is not negligible.

4.3 Time-quality balance

The point of this stage of the model is to extract the time spent for any activity into the good or the bad portion. The rest of the time not classified as good or bad is considered as indifferent portion of time. Time-quality balance may be expressed with time-quality coefficient:

$$K_{TQ} = \frac{T_Q}{T_{Sp}} = \frac{\sum_i T_{Qi}}{\sum_i T_{Spi}} = \frac{\sum_{ij} T_{Spi} \times F_{Qij} \times F_{Wij}}{\sum_i T_{Spi}} \quad \text{where} \quad \sum_j F_{Wij} = 1 \quad \text{and} \quad -1 \le F_{Qij} \le 1$$

where:

K_{TQ} = time-quality coefficient

T_Q = evaluated portion of time (positively signed – good time; negatively signed – bad time)

T_{Qi} = evaluated portion of time within the time interval *i*

T_{Sp} = time spent

T_{Spi} = time spent within the time interval *i*

F_{Qij} = quality of the quality component *j* within the time interval *i*

F_{Wij} = influence (weight) of the quality component *j* within the time interval *i*

In the examples in this paper at least two time-quality components are proposed:

AC = activity component

SC = space component

therefore:

$$j \in \{AC, SC\} \;\Rightarrow\; F_{Wi,SC} = 1 - F_{Wi,AC}$$

The activity component (AC) evaluates potential or most probable satisfaction with the activity within a given time interval, e.g. desired recreation or relaxation would be assigned +100%, driving a car ±0%, while compulsory hard labour -100%. The space component (SC) evaluates potential or most probable satisfaction with the place where activity is taking place for given activity within a given time interval, e.g. very suitable and stimulative place for certain activity would be assigned +100%, a very inappropriate and destimulative place -100%. The weight of each quality component (F_{WAC}, F_{WSC}) describes how much each component contributes to potential quality of time, e.g. potential satisfaction with the time spent in the given place.

Table 1 presents the examples of variation of daily routines of two persons (P1 and P2) when commuting by bicycle (P1b, P2b) or by car (P1c, P2c). They are neighbours living in the city. However P1 works closer to his residence than P2. Within the city centre travelling by bicycle is faster than by car due to hard traffic and parking problems, while for longer distances outside the city car is faster which reflects in time spent (T_{Sp}). From the activity a person is involved in point of view, it is assumed that time spent on a bicycle is more favourable than time spent in a car (F_{QAC}) and in this case also due to environment where this activity is performed (F_{QSC}). Cycle tracks in this city are more pleasant than busy city streets. Further, an influence rate (weight) of each component on the impression of the quality of spent time is assessed (F_{WAC}, F_{WSC}). With time-quality coefficient (K_{TQ}) quality of time spent within different routines and subroutines is compared. Perhaps is easier to understand this balance in the form of amount of quality time per routine or subroutine (T_Q). The negative balance means that performing a given activity in the considered environment is unpleasant for considered profile (i.e. user).

Simulating time-quality balance for the same profile, with exactly the same daily routine, living in the same neighbourhood, but at the other side, close to the heavy traffic road and railway line, would show that quality time balance would decrease, especially as quality of spatial component of time for sleeping, which in the previous case represents a great portion of good quality of time (8 hours), is considered as bad. In such case instead of having 12h 2’ of a good quality of time per day (example P1c in Table 1) the person has 9h 26’ of a good quality of time per day (K_{TQ} = 0.39).

		home	home	by bicycle/car	nursery/school	by bicycle/car	work	by bicycle/car	nursery/school	by bicycle/car	shop	by bicycle/car	by bicycle/car	gym	by bicycle/car	home	home	
		sleeping	preparation for go to work	going to nursery	dropping off children	going to work	working	going from work, to pick up children	picking up children	going from work, to do shopping	daily shopping and services	going home	going to recreation	recreation	coming from recreation	dinner preparation + dinner	home with a family	
P1b	T_{Sp}	8h 0'	30'	10'	5'	15'	8h 0'	15'	5'	10'	20'	10'	10'	2h 0'	10'	30'	3h 10'	24h 0'
	F_{QAC}	100	0	50	0	50	-20	50	0	50	0	50	50	100	50	100	100	
	F_{QSC}	80	80	-20	-10	-10	0	-10	-10	-20	20	-20	20	80	20	80	80	
	F_{WAC}	50	40	40	40	40	50	40	40	40	20	40	40	60	40	50	50	
	F_{WSC}	50	60	60	60	60	50	60	60	60	80	60	60	40	60	50	50	
	K_{TQ}	0.90	0.48	0.08	-0.06	0.14	-0.10	0.14	-0.06	0.08	0.16	0.08	0.32	0.92	0.32	0.90	0.90	0.50
	T_Q	7h 12'	14'	1'	0'	2'	-48'	2'	0'	1'	3'	1'	3'	1h 50'	3'	27'	2h 51'	12h 2'
P2b	T_{Sp}	8h 0'	30'	10'	5'	25'	8h 0'	25'	5'	10'	20'	10'	10'	2h 0'	10'	30'	2h 50'	24h 0'
	F_{QAC}	100	0	50	0	50	-20	50	0	50	0	50	50	100	50	100	100	
	F_{QSC}	80	80	-20	-10	-10	0	-10	-10	-20	20	-20	20	80	20	80	80	
	F_{WAC}	50	40	60	40	60	50	60	40	60	20	60	40	60	40	50	50	
	F_{WSC}	50	60	40	60	40	50	40	60	40	80	40	60	40	60	50	50	
	K_{TQ}	0.90	0.48	0.22	-0.06	0.26	-0.10	0.26	-0.06	0.22	0.16	0.22	0.32	0.92	0.32	0.90	0.90	0.50
	T_Q	7h 12'	14'	2'	0'	7'	-48'	7'	0'	2'	3'	2'	3'	1h 50'	3'	27'	2h 33'	11h 57'
P1c	T_{Sp}	8h 0'	30'	15’	5'	15'	8h 0'	15'	5'	10'	20'	15'	10'	2h 0'	10'	30'	3h 0'	24h 0'
	F_{QAC}	100	0	0	0	0	-20	0	0	0	0	0	0	100	0	100	100	
	F_{QSC}	80	80	-50	-10	-10	0	-10	-10	-50	20	-50	-50	80	-50	80	80	
	F_{WAC}	50	40	60	40	60	50	60	40	60	20	60	60	60	60	50	50	
	F_{WSC}	50	60	40	60	40	50	40	60	40	80	40	40	40	40	50	50	
	K_{TQ}	0.90	0.48	-0.20	-0.06	-0.04	-0.10	-0.04	-0.06	-0.20	0.16	-0.20	-0.20	0.92	-0.20	0.90	0.90	0.48
	T_Q	7h 12'	14'	-3'	0'	-1'	-48'	-1'	0'	-2'	3'	-3'	-2'	1h 50'	-2'	27'	2h 42'	11h 27'
P2c	T_{Sp}	8h 0'	30'	15'	5'	20'	8h 0'	20'	5'	10'	20'	15'	10'	2h 0'	10'	30'	2h 50'	24h 0'
	F_{QAC}	100	0	0	0	0	-20	0	0	0	0	0	0	100	0	100	100	
	F_{QSC}	80	80	-50	-10	-10	0	-10	-10	-50	20	-50	-50	80	-50	80	80	
	F_{WAC}	50	40	60	40	60	50	60	40	60	20	60	60	60	60	50	50	
	F_{WSC}	50	60	40	60	40	50	40	60	40	80	40	40	40	40	50	50	
	K_{TQ}	0.90	0.48	-0.20	-0.06	-0.04	-0.10	-0.04	-0.06	-0.20	0.16	-0.20	-0.20	0.92	-0.20	0.90	0.90	0.47
	T_Q	7h 12'	14'	-3'	0'	-1'	-48'	-1'	0'	-2'	3'	-3'	-2'	1h 50'	-2'	27'	2h 33'	11h 18'

T_{Sp}	time spent (hours, minutes)	by car (incl. walking and parking time)		
F_{QAC}	quality of activity component of time (%)	by bicycle (incl. walking and parking time)		
F_{QSC}	quality of spatial component of time (%)			
F_{WAC}	influence of activity component of time (%)		hour	h
F_{WSC}	influence of spatial component of time (%)		minute	'
K_{TQ}	coefficient of time-quality			
T_Q	quality time (hours, minutes)			

Table 1: Quality time balance for total daily routine for variations of P1 and P2, when commuting by bicycle or by car.

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5 PRACTICAL RELEVANCE

The main issue of the paper is reflected in the notion that quality of life is closely linked to the quality of place and quality of time spent in this place and its surrounding. Therefore, the capital challenge was to set up a time-place oriented approach for measuring quality of living environments. Why is this important? Why such approach seems to have the future? When addressing any local change spatial conditions for that change its related activities and quality of time spent in relation to that activity, matters! Complex development at local level which may suit their users best is hardly ever questioned.

Giving local scale, i.e. micro data, a bigger value and accepting cross-scales analysis enable gaining well informed knowledge about relationships between various elements and quality of living in local areas and their influential environments. Such notion represents an important starting point of developing of the model for valuation and simulation of quality of living environments, debated within this paper. However, reasoning further in terms of how to actually measure this quality of living environments represents the intriguing question which was addressed. As other known approaches (e.g. Blomquist, 2006; Baker and Palmer, 2006), the proposed model also addresses comprehensive aspects of quality of life (e.g. social, economic, spatial), but the novelty of the approach is in the way these aspects are linked together and finally translated into a universal measure: time. Basic outputs of the model are calculations of time balance, economic balance and time-quality balance.

Such calculated data are linked to locations and user profiles and are useful for:

- comparison of profiles within different locations of the area,
- judgement about suitability of certain location in the area for various profiles.

In the proposed model, understanding and defining boundary profiles is of key importance. They are defined as profiles bordering on two or more segments, depending on numbers of parameters used for defining boundaries. Analysis of the results for any studied segment of population show acceptability and quality of places for a particular segment of population. This enables to examine how well does a certain place suit this group of users and how well does it enable their co-habitation. Accordingly, examination of suitability of location for the weakest profiles can show which profile can reach the minimum satisfaction at certain location in the area. There can be different profiles recognised as the weakest at different locations within the studied area.

Basically, the model works as a tool for simulation of spatial polycentric development at different scales, from local to regional and for various subjects of interests. In the paper quite straight forward subject was addressed to discuss the model (individual living). However, by the analogy the subject can be any kind of entity which can have its specific characteristics and needs and can be described with significant routines and behaviour. This means that the model can be applied also upon business subjects as such, employees, customers and the like. To illustrate, there is an example what can be the most usual unit of examination at each specific scale. Basic unit of examination at the local scale is individual profile, defined either as a person, as exemplified and discussed in the paper, or as a local business or service. At the level of urban agglomeration the basic unit of examination is a community profile, a small group of individuals, e.g. creative industry unit profile. Taking into account broader and more influential area, let say sub regional level, settlement profile represented by medium group of people becomes in focus, e.g. public service profile. Talking about regional level, relations between urban centres and their influential areas become in focus. It addresses large group of people, most typically mobility issues.

The model itself exemplifies a development of new knowledge and innovation in the interchange of fields of urban planning, spatial development and territorial governance. It reflects an innovation via synergy of basic urban planning and design knowledge, creativity and mathematical modelling. It is designed as a tool that can help to simulate, direct and monitor spatial development and economy integration at the interface of regional and local levels. Its applications and use will show more practical advantages and disadvantages. Having rich database including GIS spatial, socio – economic and other derived time-related data can be presented on the maps. Such result can be a profile's suitability map. When more profiles are involved, suitability map of a community would be recognised as a final output of the model. In terms of knowledge and innovation, the future challenge is in upgrading it as a web-tool to be used for simulation of placement of activities in places and assessing the suitability of social, physical and business environment for the tested activity. Therefore future challenges are in testing it at as many subjects and cases as possible.

6 CONCLUSION

Based on the notion of this paper, people-friendly cities and from this point of view smart cities are cities with minimum time waste for their users. They represent places where residents and other users are able to qualitatively spend their time. Furthermore, such cities must enable as broad spectrum of users as possible (e.g. considering peoples' age, socio-economic situations, ethnic groups, impaired people, etc.) to fully fulfil their needs and expectations.

Accordingly, time balance is a category which is place and user dependent, i.e. it is possible to be established when having defined a profile and the belonging space. Time balance is the initial result of the model representing the main tool for evaluation of suitability of the place for someone or something. It shows how comfortable the time is offered to the user by his/her (living) environments. Economic balance is a category which represents subject's incomes and expenses for necessary and optional activities. It represents a financial frame within which the subject is flexible to be able to perform its activity in a certain environment. Time-quality balance is the final measure of quality provided with the proposed model. Based on spatial characteristics, taking in to account the character of the activity and economic situation of the subject involved in the activity, it classifies time spent regarding the activity as such as well as the environment in which the activity is taking place as well or badly spent time. This time-quality balance must be examined for at least in three significant situations: satisfaction of/for crucial subjects, average satisfaction, and minimum satisfaction, i.e. satisfaction of the weakest profile. Finally, the quality is expressed by time-quality coefficient KTQ.

The applicable value of the model is in showing suitability of a certain location for a chosen profile in comparison with some other location for the same profile; or in showing suitability of a location for one profile in comparison to another. This is especially important when the aim is to simulate a community with certain characteristics represented via bunch of profiles, or at least with a boundary profile and the most common profile. Thus, the model can be applied for setting new development in a place, searching for measures for improvements, comparison of different locations for one particular use, and comparison for various measures in a certain location. When the subject in focus is a service or business, it is important, to understand that time balance and financial balance are analysed in terms of the subject of businesses or services as such, and that time-quality balance is analysed also regarding the employees there as well as regarding the customers.

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