

# How we know if a smart city will produce happy people?

Leena Ilmola, IIASA/ASA

Towards Green Smart Cities in the IoT Era

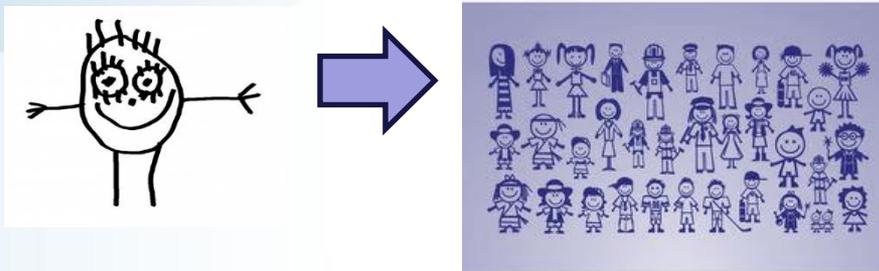
Tokyo Univesity March 20, 2018

# Five questions

1. Why to measure happiness?
2. What do happiness theories say about happiness?
3. Urban planning and happiness – is there a connection?
4. Measurement options
5. Our concept

# Why to measure?

1. Two Prime Ministers' Offices request
  - Public services and happiness
  - Holistic perspective, national policy implications
2. Smart city Index should include human dimension as well
  - not emotional reactions\*) but *living* in urban environment
3. Green Bonds\*) – reliable validation for investor for smart cities
  - Reliable feedback for city/region development
4. To help people to master their own life.



\*) Shoval, N., Schvimer, Y., & Tamir, M. (2018). Tracking technologies and urban analysis: adding the emotional dimension. *Cities*, 72, 34-42.

\*\*\*) <https://www.icmagroup.org/assets/documents/Regulatory/Green-Bonds/GreenBondsBrochure-JUNE2017.pdf>

# UN World Happiness Report



**Figure 2.2: Ranking of Happiness 2015-2017 (Part 1)**

1. Finland (7.632)
2. Norway (7.594)
3. Denmark (7.555)
4. Iceland (7.495)
5. Switzerland (7.487)
6. Netherlands (7.441)



- Explained by: GDP per capita
- Explained by: social support
- Explained by: healthy life expectancy
- Explained by: freedom to make life choices

- Explained by: generosity
- Explained by: perceptions of corruption
- Dystopia (1.92) + residual
- ⇌ 95% confidence interval

# Variables

1. GDP per capita is in terms of Purchasing Power Parity (PPP) adjusted to constant 2011 international dollars, taken from the World Development Indicators (WDI) released by the World Bank in September 2017. See Appendix 1 for more details. GDP data for 2017 are not yet available, so we extend the GDP time series from 2016 to 2017 using country-specific forecasts of real GDP growth from the OECD Economic Outlook No. 102 (Edition November 2017) and the World Bank's Global Economic Prospects (Last Updated: 06/04/2017), after adjustment for population growth. The equation uses the natural log of GDP per capita, as this form fits the data significantly better than GDP per capita.
2. The time series of healthy life expectancy at birth are constructed based on data from the World Health Organization (WHO) and WDI. WHO publishes the data on healthy life expectancy for the year 2012. The time series of life expectancies, with no adjustment for health, are available in WDI. We adopt the following strategy to construct the time series of healthy life expectancy at birth: first we generate the ratios of healthy life expectancy to life expectancy in 2012 for countries with both data. We then apply the country-specific ratios to other years to generate the healthy life expectancy data. See Appendix 1 for more details.
3. Social support is the national average of the binary responses (either 0 or 1) to the Gallup World Poll (GWP) question "If you were in trouble, do you have relatives or friends you can count on to help you whenever you need them, or not?"
4. Freedom to make life choices is the national average of binary responses to the GWP question "Are you satisfied or dissatisfied with your freedom to choose what you do with your life?"
5. Generosity is the residual of regressing the national average of GWP responses to the question "Have you donated money to a charity in the past month?" on GDP per capita.
6. Perceptions of corruption are the average of binary answers to two GWP questions: "Is corruption widespread throughout the government or not?" and "Is corruption widespread within businesses or not?" Where data for government corruption are missing, the perception of business corruption is used as the overall corruption-perception measure.
7. Positive affect is defined as the average of previous-day affect measures for happiness, laughter, and enjoyment for GWP waves 3-7 (years 2008 to 2012, and some in 2013). It is defined as the average of laughter and enjoyment for other waves where the happiness question was not asked.
8. Negative affect is defined as the average of previous-day affect measures for worry, sadness, and anger for all waves. See Statistical Appendix 1 for more details.

[https://s3.amazonaws.com/happiness-report/2018/WHR\\_web.pdf](https://s3.amazonaws.com/happiness-report/2018/WHR_web.pdf)

# A TOOL FOR IMPROVING LIFE QUALITY

## TWO USER GROUPS:

### The happiness measurement system

*Individuals: for our members in collaboration with them (user-driven innovation)*

*City (community) happiness measurement for user centric service and city development.*

## PRINCIPLES

- User- innovation
- Mixed data approach.
  - Deep data from users.
  - Big data (such as sensor data or mobility patterns) from IoT
  - Fast data from automatic measurement device

# What is happiness about?

Erik Allardt (1993):

Having, Loving, Being.

Amartya Sen (1993):

Substantial freedom

Martha Nussbaum (2011):

Life, bodily health, bodily integrity, senses, imagination and thought, emotions, practical reason, affiliation, other species, play, and control over one's environment.

Bhutan's Happiness Index (Ura et al. 2012) survey

The pursuit of happiness is collective, experienced personally

9 fields: Psychological wellbeing, time use, community vitality, cultural diversity, ecological resilience, living standard, health, education, good governance

32 indicators and 124 variables

Allardt, E. (1993). Having, loving, being: An alternative to the Swedish model of welfare research. *The quality of life*, 8, 88-95.

Sen, A. (1993). Capability and well-being. *The quality of life*, 30.

Nussbaum, M. C. (2011). *Creating capabilities*. Harvard University Press.

Ura, K., Alkire, S., Zangmo, T., & Wangdi, K. (2012). *A short guide to gross national happiness index*. The Centre for Bhutan Studies.

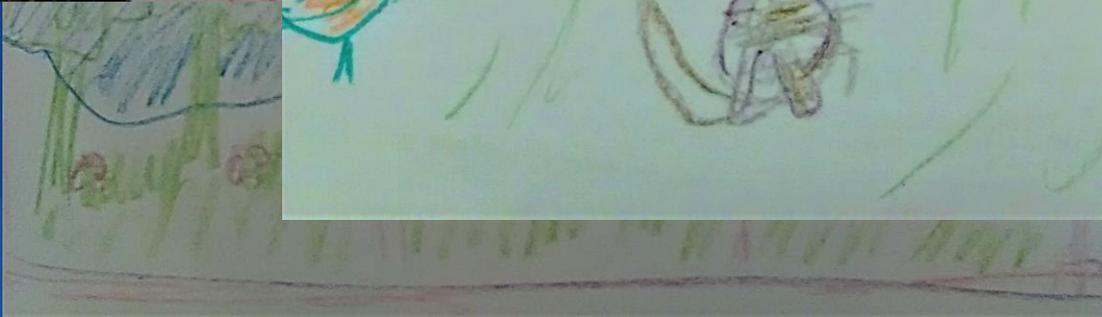
# Well-being measurement

WELLBEING DATA COLLECTION		
1. <i>Life length and quality</i>	4. <i>Senses, Imagination, and Thought</i>	7. <i>Affiliation</i>
<b>1.1. Perceived wellbeing</b>	<b>4.1. Learning</b>	<b>7.1. Empathy</b>
1.1.1. Health, physical capabilities	4.1.1. Capabilities	7.1.1. Perceived empathy
1.1.2. Self-organization in life	4.1.2. Activities	7.1.2. Actions for helping others
1.1.2.1. Autonomy	<b>4.2. Creativity</b>	7.2. Having the social bases of self-respect
1.1.2.2. Competence	4.2.1. Activities	7.2.1. Feeling of appreciation by other
1.1.2.3. Relatedness	4.3. Spiritual development	7.2.2. Perceived equality in social connection
<b>1.2. Self-defined objectives</b>	4.3.1. Practice and development	
<b>1.3. Self-defined actions to support goals</b>	<b>4.4. Contribution to the societal problem solving</b>	8. <i>Other Species</i>
	4.4.1. Activity	<b>8.1. Carbon footprint</b>
2. <i>Bodily Health</i>	4.4.2. Impact	8.2. Impact on nature's diversity
<b>2.1. Health requirements that is needed for a full, desired life</b>		
2.1.1. Physical stamina	5. <i>Emotions</i>	9. <i>Play</i>
2.1.2. Muscular strength	<b>5.1. Deep social relationships</b>	<b>9.1. How many times you laughed yesterday</b>
2.1.3. Balance and agility	5.1.1. Rewarding support	<b>9.2. What was the best moment of last week</b>
2.1.4. Blood pressure, heart rate, blood sugar,	5.1.2. Frequency of interaction	
<b>2.2. Nourishment that will support desired life</b>	5.1.3. Access to help	10. <i>Control over one's Environment.</i>
2.2.1. Energy intake	<b>5.2. Feeling of acceptance, to be loved</b>	<b>10.1. Political, city planning</b>
2.2.2. Vitamins, minerals, acids etc. intake		<b>10.2. Material.</b>
2.2.3. Special diet if needed	6. <i>Practical Reason</i>	
<b>2.3. Preventive measures against a specific illnesses or weaknesses</b>	<b>6.1. Planning of</b>	
	6.1.1. Health related activities	
3. <i>Bodily Integrity</i>	6.1.2. Social activities	
<b>3.1. Subjective feeling of security and safety</b>	6.1.3. Personal economy	
3.1.1. Inside of home	<b>6.2. Assessment of improvement of own life</b>	
3.1.2. Outside of home	6.2.1. Analysis of own identity	
3.1.3. Autonomous safety and security		

*It is a happy Tuesday morning in 2030. You feel good, better than ever.*



my  
, to be  
ay...



# DIMENSIONS OF PURPOSEFUL LIFE

According to the people the purposeful life\*) consists of

1. Social wellbeing (affiliation development, emotional contacts, various social activity, activity outside of home, intensity and frequency of social interaction)
2. Contribution to society (empowerment, impact on society, work opportunities, NGO activity, helping peers)\*\*\*)
3. Mental wellbeing (development of thought, energy level, creativity, learning, balance)
4. Physical (bodily health and integrity, exercise activity, personal nutrition situation, biomarkers if possible, safety and security) status \*\*)

\*) *World Happiness Survey (2017): "life purpose plays a strongly supportive role, independent of the roles of life circumstances and positive emotions."*

\*\*\*) Global evidence also suggests that two key social variables—social support and volunteering—are in most countries consistently associated with better self-reported health status.

\*\*) Trust has long been seen as an especially important support for economic efficiency. Trust among participants is an asset vital to dealing with the many contingencies that lie beyond the power of contracts to envisage. It also helps to ensure that contracts themselves will be reliable. Empirical research over the past twenty years on the social basis of economic efficiency has given trust a central role, seen as an element or consequence of social capital, which the OECD has defined as "networks together with shared norms, values and understandings that facilitate co-operation within or among groups."

# Method guidelines

Rennwick and Brown 1996: QoL is multidimensional

- QoL meaning is individual;**
- QoL appraisal must be holistic;
- QoL is bio-psycho-social;
- Disability does not imply increased/decreased QoL; and
- QoL components are common to all people and the human condition.

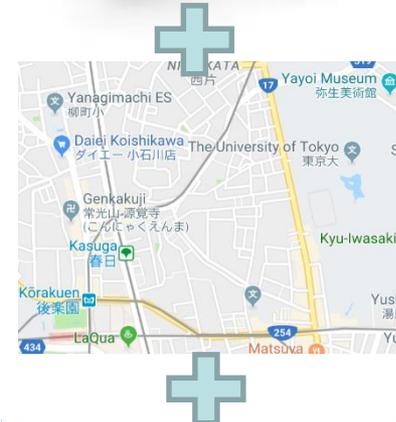
# Concept to be piloted

## WELLBEING DATA COLLECTION

<p>1. <i>Life length and quality</i></p> <p><b>1.1. Perceived wellbeing</b></p> <p>1.1.1. Health, physical capabilities</p> <p>1.1.2. Self-organization in life</p> <p>1.1.2.1. Autonomy</p> <p>1.1.2.2. Competence</p> <p>1.1.2.3. Relatedness</p> <p><b>1.2. Self-defined objectives</b></p> <p><b>1.3. Self-defined actions to support goals</b></p>	<p>4. <i>Senses, Imagination, and Thought</i></p> <p><b>4.1. Learning</b></p> <p>4.1.1. Capabilities</p> <p>4.1.2. Activities</p> <p><b>4.2. Creativity</b></p> <p>4.2.1. Activities</p> <p>4.3. Spiritual development</p> <p>4.3.1. Practice and development</p> <p><b>4.4. Contribution to the societal problem solving</b></p> <p>4.4.1. Activity</p> <p>4.4.2. Impact</p>	<p>7. <i>Affiliation</i></p> <p><b>7.1. Empathy</b></p> <p>7.1.1. Perceived empathy</p> <p>7.1.2. Actions for helping others</p> <p><b>7.2. Having the social bases of self-respect</b></p> <p>7.2.1. Feeling of appreciation by other</p> <p>7.2.2. Perceived equality in social connection</p>
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## EDA/ECL ring

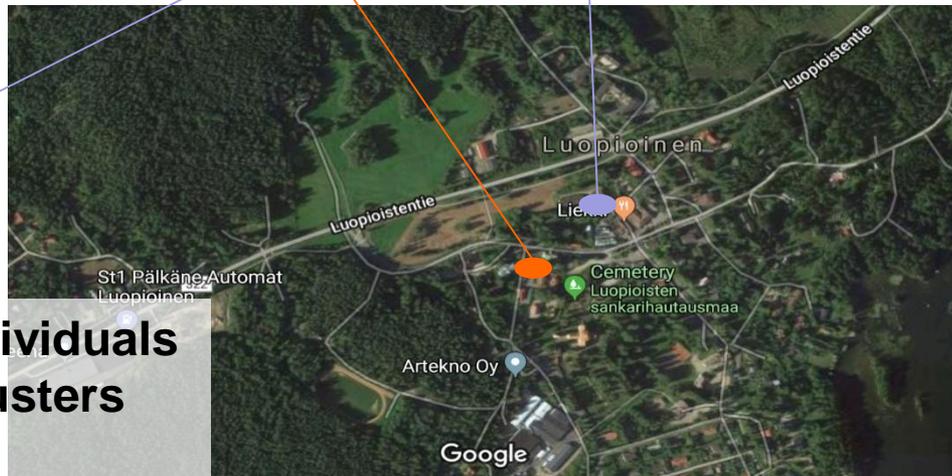
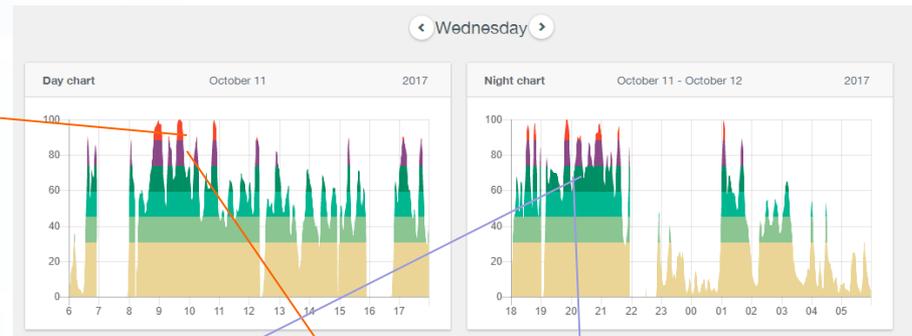
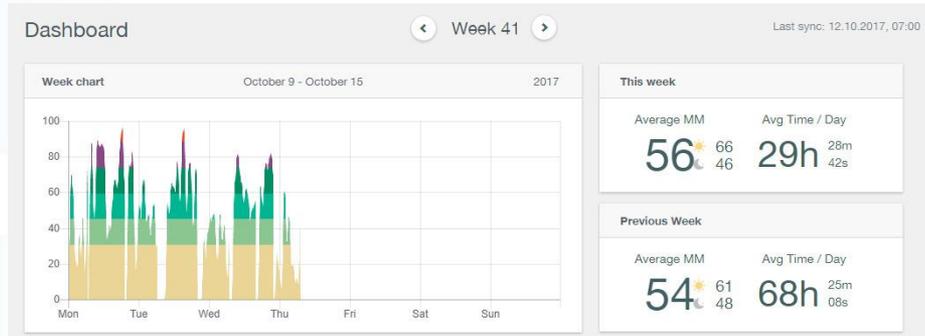


### The good day or moment

Please: Think about recent past, yesterday or last week and remind a moment that you felt that your life was good. Please choose the picture that describes best your life at its best!



# Reporting



**Phase I: correlations for individuals**  
**Phase II: correlations for clusters**  
**(big data)**

# Discussion

- EDA measurement is controversial by its nature
  - Same arousal level for excitement and fear
  - Will users use the ring, alternative devices are expensive
- User have to spend some minutes per day with the qualitative feedback
  - Automatic measurement of noise levels
- Does the combination measure purposeful life?
  - Micro movements recording?
- Access to 1000 users require true user benefit

*Thank You!*

*Please contact:  
ilmola @iisa.ac.at*