Smart City for Smart People

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1 ABSTRACT

Korneuburgs way2smart started in the year 2011, when the municipality of the town decided to start a big participation-project to define a Vision Statement and a Master Plan for its urban development.

Smart people – citizens, politicians and administration - planned Korneuburgs way to 2036: with ambitious objectives in terms of energy and CO_2 saving and concentration on "social interaction". 2036 onwards, the municipality of Korneuburg wants to be energy-self- sufficient and carbon-neutral. With the Smart City demo-project "way2smart" measures of the Master Plan will be implemented evaluated regarding their feasibility and adapted if necessary.

Smart technologies: The municipality of Korneuburg intends to rehabilitate two municipality-owned residential buildings, densify the area by way of superstructures and annexes and equip them with energy-generating areas – not for building nice penthouses for rich people, but covering young tenants' demand for affordable small apartments.

As accompanying measures, communications programs involving the buildings' existing and new tenants as well as the further development – because neighbourhood is a big impact for the quality of lifestyle. Last, but not least, mobility measures like e-carsharing, a hitch-hiking-station, good cycle-parking-facilities etc. create the possibility to be mobile without a private car.

Ultimately, the endeavours to achieve the ambitious objectives in terms of energy and CO_2 saving in Korneuburg by 2036 are to be documented in a database in order to make the individual measures available as models and stimuli for comparable projects in the town.

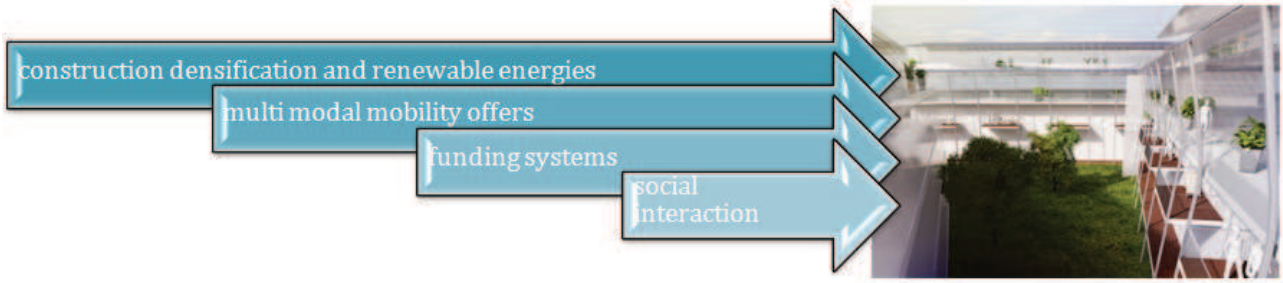

Fig. 1: Korneuburgs way2smart – technics, financing systems and social interaction

2 INTRODUCTION

Korneuburg wants to become a smart city.

Maybe the expression "city" is not the perfect word for a town with about 12.000 inhabitants, but Korneuburg is growing - forecasts say, about 50 % rise in population until 2036. Many people, mainly from Vienna, like to come and live here because of the high quality of lifestyle – the "green area" next to Austria's capital. But the community area is rather small, densification is the only way to increase - so the small town will become a small city.

From 2036 onwards, the municipality of Korneuburg wants to be energy-self-sufficient and carbon-neutral. In order to follow up on its "Korneuburg 2036" vision statement and master plan with concerted measures, a demonstration project was launched to demonstrate that energy-sufficiency and carbon-neutrality measures can be definitely reconciled with socially-compatible, affordable housing and living space as well as with eco-efficient mobility.

In "way2smart" two approaches shall be followed: the top down and the bottom up approach.

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3 TOP DOWN: WAY2SMART SHALL DEMONSTRATE, HOW LIVING 2036 CAN BE

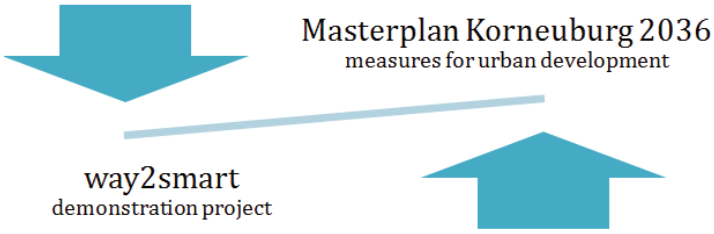

Fig. 2: Korneuburgs way2smart shall demonstrate, how living 2036 can be

The Masterplan2036, Korneuburgs urban development concept, created with public participation, is based upon 3 pillars: social interaction, education and water. Public participation and energy-self-sufficiency are the foundation, on which these pillars are built. Various of the derived measures for the development of the town were included in the research-project way2smart.

Way2smart shall demonstrate, how energy-self-sufficiency and high quality of life is affordable also for small budgets.

Low-energy-constructions and passive-houses already became usual standards in Austria – at least for new single-family-houses. The photovoltaic-plant on the roof of the house in the country is some kind of status symbol. Also e-mobility becomes chic – a status symbol for the environmental engaged middle-class. People with low income have to economise. Rents are high, energy-efficiency and renewable energies seem to be a luxury, they cannot afford. In the sector of renovation, particularly in the low-price-sector of community-housing, the decision of the energy-standard mainly depends on the costs of construction. The payback-period of investments in energy-efficiency is fixed on the credit-period (about 20 years) - low energy-prices at least are not helpful for a booming energy-efficiency in social-housing projects.

For reaching the goal of energy-self-sufficiency and carbon-neutrality we have to go one step further: Climate protection has not only to “become sexy”, as Arnold Schwarzenegger promoted this in Vienna 2013 – it also has to become affordable for anybody.

The project way2smart combines proven and new technical, social and funding systems with one goal: making the energy-self-sufficient living favourable – and prove, that carbon-neutrality is not a luxury, we cannot afford. Way2smart is made to show, how living in “Korneuburg2036” shall be possible for everybody.

3.1 Construction and technologies

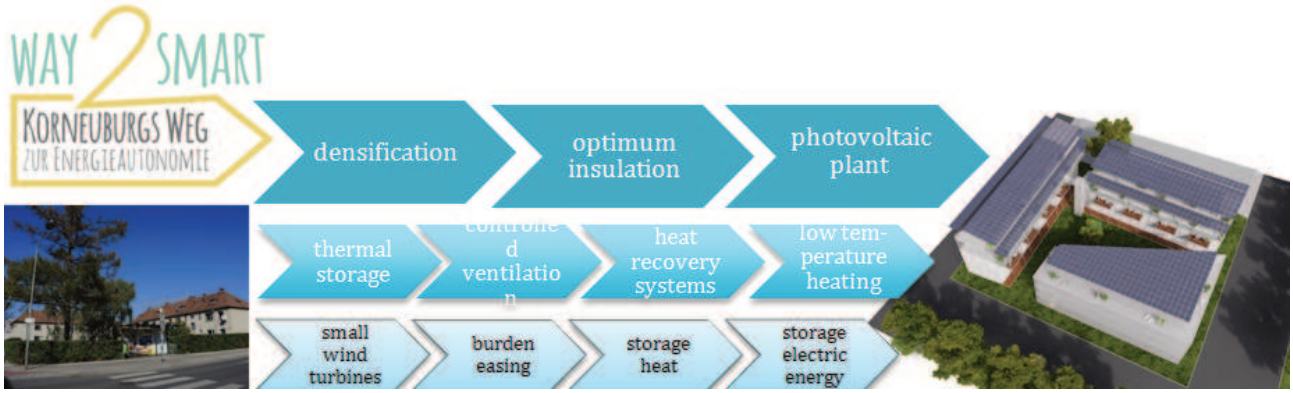

Fig. 3: Constructions densification and solar energy are the technical keys to Korneuburgs way2smart

The technologies for high-efficiency-standards and the generating of renewable energy used in the project way2smart are mostly well-approved: building densification, optimum insulation, central low-temperature-heating systems, thermal storage, controlled domestic ventilation and heat recovery systems will reduce the energy-demand to a minimum. Last but not least a big photovoltaik-system will supply the renewable energy for housing and mobility in the residental project of way2smart.

Also the application of new technologies is part of the way2smart: Small wind-turbines, systems for easing the burden of higher level grids and for the storage of heat and electric energy will be examined.

The technical key-innovation of the project way2smart is the „photovoltaic roof-landscape“, a system of optimized photovoltaik-surfaces especially for hightening buildings. On buckled and folded roofs solar-energy for up to 7 floors can be provided. The „photovoltaic roof-landscape“ plays also an important role for shadowing and daylight-utilisation. The combination of hightening buildings and optimizing the roof-landscape for solar production will be replicable to other buildings.

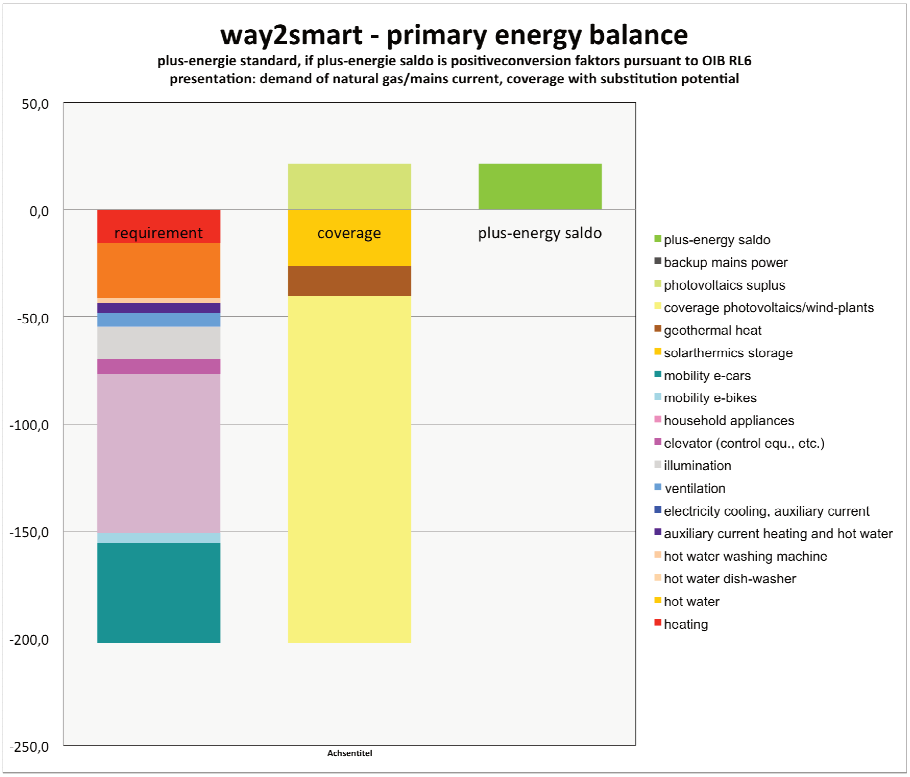

Fig. 4: primery energy balance way2smart

Korneuburgs way2smart is also following old rules: the small flats will be renovated but not increased. Living in compact, small and smart flats is in principle energy-efficient (and affordable). Quality proves its value – the common use of technical equipment can help saving energy (and money)

3.1.1 Smart mobility projects

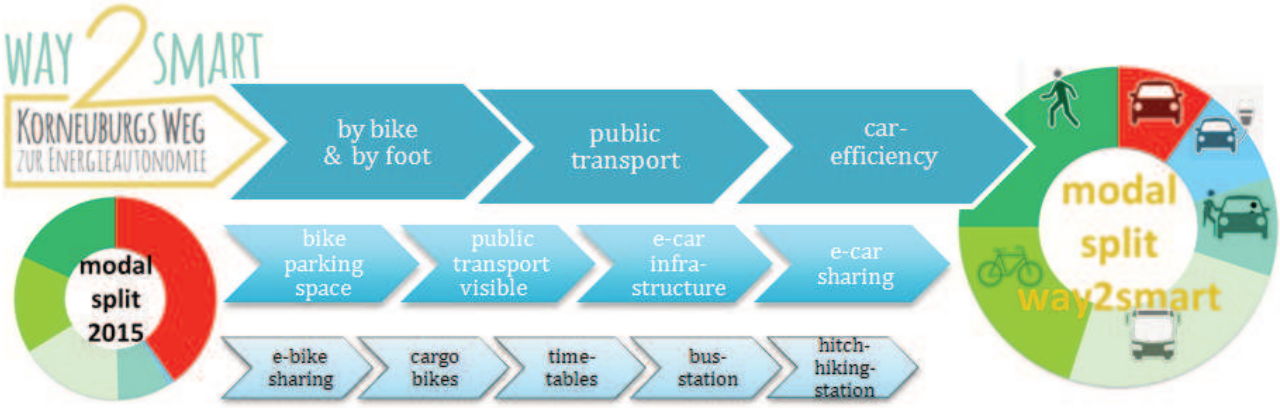

Fig. 5: Korneuburgs way2smart also includes mobility-measures

Growing population in a small and limited area requires mesures for smart mobility – not only because of the insufficient infrastructure and environmental impacts caused by further rising motorised privat transport. It is also responsible for nearly one third of the towns greenhouse gas emission.

That’s why the goal of energy-self-sufficiency and carbon neutrality in the project way2smart also includes the mobility of the tenants. Mobility costs will be an important argument for the use of alternative mobility offers – by comparison to the use of “the own car” about € 1.000 per person and year can be saved by

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accepting these offers. information and creating awareness is part of the buddy-programm (see „social interaction and communication).

Last but not least it will not be possible to build the whole amount of required parking spaces at the construction-area of the residental building, the goundwater level is to high for 2 underground-parking levels. Building regulation of lower Austria prescribes 1 parking space per residental unit, the city-council of Korneuburg rised the requirements to 1 ½.

There are many reasons to keep the amount of “own cars” as small as possible – at least the costs for parking space in urban areas.

Way2smart offers intermodal mobility instead:

- optimizing bicycle parking space: higher amount (1 per person instead of per flat), higher quality (save locking, easy acessible)
- e- and cargo bikesharing
- better information about public transport offers (make public transport „visible“)
- electricity filling station
- e-carsharing
- hitch-hiking-station

The mesures will be testet and optimized in the project way2smart and shall than be spread over the town’s area.

3.2 Funding systems – keeping rents affordable

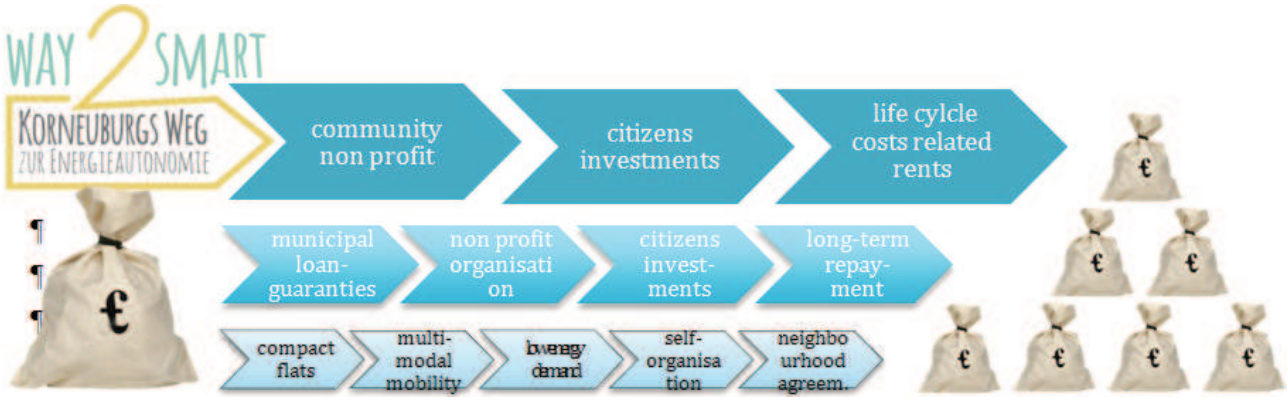

Fig. 6: Funding systems keep the rents affordable

Community housing can be offerd at affordable rents, because they are not built to rise profits, but to increase the social wellfare of the citizens. For Korneuburgs way2smart further measures are planned, to keep the rents affordable: New financing-systems like citizens investments and life-cycle-cost-relatet financing ensure, that tenants pay fair rents and energy-prices. Other mesures allow the tenants to safe money, like the multimodal mobility-offers and self-organisation and neighbourhood agreement (see social interaction).

3.2.1 Citizens investments

Investments in producing renewable energies will be financed autonomous by citizens investments. People are invited to invest in a regional project – the loan is paid back with the energy-sales revenues. To rise the economical benefit of these invetstments different methods to rise the energy-consumption on-site the residental-building will be analysed: on one hand financial incentives for tenants to use the produced energy in-time, on the other hand the use of micro-storage systems (also battery-storage in e-cars).

3.2.2 Life cycle costs - related rents

Way2smart goes one step further to ensure fair rents also for high-quality buildings: life cycle costs – related rents means to split and finance the costs in accordance with the lifetime of the investment. Different parts of the new building will be evaluated according to their expected lifetime. On this basis the credit period for the

investments in the renovation shall be adapted. So every tenant pays only for the part of the investment he oder she uses - and the value of investments in high quality becomes visible.

This would be rather easy with the public funding system of former times. There is still a loan to be payed back for the construction of the original building we work with – its credit period is 102 years, the annual rate is about € 220,--. And as you can see, there is still a building and its value is higher than the € 6.000 that still has to be payed back until 2040.

But on todays credit market you hardly find loans with a repayment-period longer than 30 years. Also the public funding for renovating residental buildings in lower Austria occurs via interest subsidys for credits running for 15 or 20 years. That means, with the usual financing system the complete renovation and construction has to be payed back in about 20 years – even though the benefit of parts of the investment remains up to 80 or 100 years.

The credit rates for the investments in a renovation have to be payed back by the tenants via the rents, so the tenants during a period of about 20 years after the renovation partially pay for the tenants living there during the next decades. On one hand this system is not fair. On the other hand it prevents investments in high quality and long living components and materials, because the benefit of their added monitary value becomes tangible years after the envestment. Tentants of community residental buildings have to economize.

The solution might be a mixture of bonded and amortisising loans relativly to the life cylce costs. The local council will have to decide about the funding system and also the tenants will have to agree. Although long-term financing for construction-projects is a wellknown and logical justified method it is not applied anymore, so the benefits have to be proven to politicians and tenants. Therefor the calculations have to be transparent and comprehensible and long-term evaluable.

3.3 Social interaction and communication

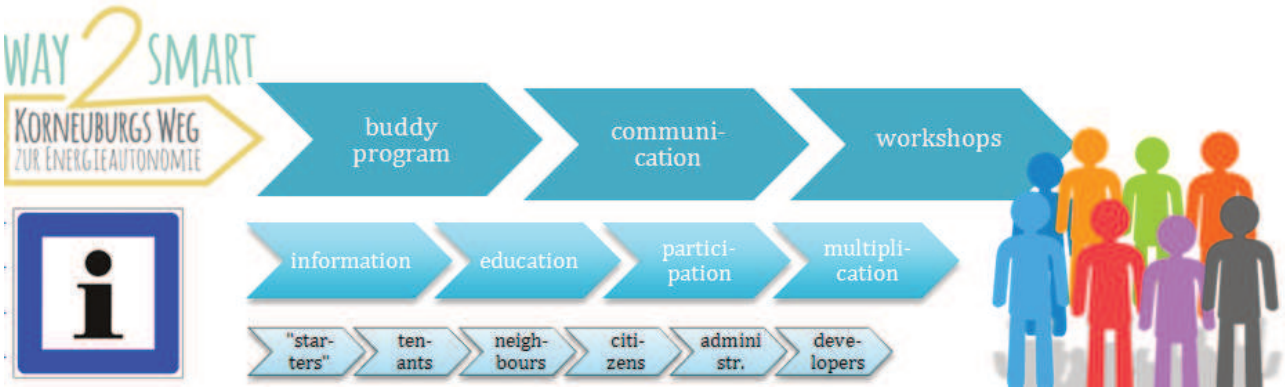

Fig. 7: social interaction and communication for better acceptance

It's not only the technical equipment, that makes living smart. Social interaction and communication play a key role in our project. The residential building with up to 50 flats is also meant to be a model for best practice housing community. We want the tenants to be inspired by the lifestyle in an energy-self-sufficient building with a housing community that supports self-organisation and invites to participate and engage.

It's a small town's advantage, that neighbours know each other, learn to respect each other and finaly help each other. Especially if the monetary income is not too high (there are income-limits for getting a community housing in Korneuburg), the value of a good neighbourhood should not be underestimated.

3.3.1 The "buddy program"

The way2smart includes a special offer for young people searching for their first own housing. „Starter flats" can be hired for a limited time (3 years) for a lower rent. The first step to independence and a possibility to find out, what is important for the own lifestyle.

That's why a so called „buddy program" will be installed. It includes information and education at eye-level on topics like the correct use of the technical equipment, possibilities for self-organisation (person of trust as representing the tenants, management of car sharing and common rooms, and so on). Speakers and teachers come from relief organisations as well as „ordinary citizens" from Korneuburg, sharing their special knowledge. That „at eye level" plays a key role for the way2smart communication. It's easier to accept or

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believe, to discuss and finally be inspired from a message, if it is delivered from someone, you can identify with. The buddy-program reaches it's goal, when „the starters" are inspired by the lifestyle of way2smart and carry their experience to their next housing community.

On the one hand, users training is important to gain the full efficiency of the technical equipment. If tenants understand the technical background of users-instructions it's easier to act accordingly. On the other hand neighbourhood-assistance helps saving money, strengthens the self-confidence and supports cooperation, respect and good relation between tenants.

3.3.2 Early communication with neighbours and tenants

Last, but not least, communication with tentants and neighbours will take place as early as possible, at a time, when the extentions and plans of the building are not fixed. So the wishes and worries of tentants and neighbours can be taken in consideration, if they are useful and sustainable.

Korneuburg is a small town with limited construction area and a high population growth. Building densification and its (non-)acceptance in public and particulary in the neighbourhood plays an important role in the Masterplan2036. Many construction-projects of the last years lent to controverses with the neighbours, some of them were temporary stopped by the protests. The solution for this problem provided in the Masterplan is earlier and better communication between building owners and affected citizens.

The possibility to participate in design-developement of a building creates satisfaction with the living environment – for tenants and neighbours. Not every wish can be fullfilled – but if some negative impacts and worries can be cleared out in advance, we expect a higher acceptance of the project in the neighbourhood.

3.3.3 Property developers' workshops

How to motivate property developers to build smart?

Experiences made in the realisation of the construction project, the mobility measures and the participation-process will be shared and discussed in property developers workshops. Possibilities for local councils promotion and support of smart-city measures in further construction projects will be the result of these workshops. Of course the workshops shall also motivate the property developers to take smart measures.

4 BOTTOM UP: EVALUATION OF THE WAY TO ENERGY SELF SUFFICIENCY

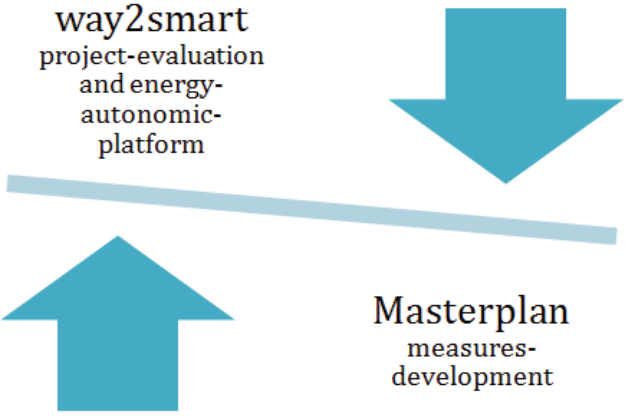

Fig. 8: bottom-up: evaluation

The municipality of Korneuburg decided the town to be energy-self-sufficient and carbon-neutral in 2036. The energy-autonomic-platform visualizes the necessary measures, describes smart projects and their contribution to reaching the goals also as the implementation level of energy-autonomic in Korneuburg.

150 micro-districts are defined, spatially mapped and partially filled with basis-data like extension, age of building and modernisation, building type (e.g. single-family-house) and its current energy performance. In a first step community-owned buildings will be recorded, in a second step it will be usable also for private buildings. Data protection and privacy plays a key-role in this part of the project.

5 CONCLUSION

Fig. 9: Sustainable livestyle is not a privilege for rich people

Korneuburgs way2smart is a project with many various approaches playing together for reaching one goal: to demonstrate, that sustainable lifestyle is not a privilege for rich people but possible for everyone. Ideas from citizen participation as well as new and „old“ technologies will be examined to find out the ecological, economical and social optimum combination for a smart city.

6 REFERENCES

TEAM DER PROJEKTGRUPPE “LEITBILD UND MASTERPLAN KO 2036, scientific support: 17&4 Organisationsberatung GmbH, Universität für Bodenkultur, HUB-Architekten, Leben im Zusammenfluss, Leitbild der Stadt Korneuburg, Korneuburg, 2014.

GALOSI A., KLEPIC V., KNÖBL K., RÖßLER M., ZIEGLER M., scientific evaluation Zelger Thomas, DI, FH Technikum Wien, Energieautarke Gemeinde Korneuburg 2036, Vienna 2012

IBO, ÖSTERR. INSTITUT FÜR BAUEN UND ÖKOLOGIE, Passivhaus-Bauteilkatalog, new edition, expected date of publication Sept 2016

AMANN C., SAMMER K., HAVEL M., WIRTH D., OETTL F., SCHÖBERL H., BERGER H., Gründerzeit mit Zukunft, Subprojekt 2: Grundlagen und Machbarkeitsstudien, Vienna 2013

HACKE Ulrike, LOHMANN Günter, Institut Wohnen und Umwelt GmbH, Akzeptanz energetischer Maßnahmen im Rahmen der nachhaltigen Modernisierung des Wohnungsbestandes, Darmstadt 2006

ABRAHAMSE W., STEG L., VLEK C., ROTHENGATTER T., A review of intervention studies aimed at household energy conservation. Journal of Environmental Psychology, Groningen 2005

BERAN C., PIRINGER M., ROCH R.,: ClimateCoolers2020 Evaluierung von Aktivitäten zur Bewusstseinsbildung für Energiespar- und Umweltschutzmaßnahmen in der offenen Jugendarbeit, Vienna 2010

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