City-zen: New Urban Energy

Izmir 'City-zen Roadshow' REPORT

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NEW URBAN ENERGY

Izmir (Bornova) Roadshow REPORT

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6	HESPUL Association	HESP	FR
7	The Queens University of Belfast	QUB	UK
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11	Stichting Waternet	WAT	NL
12	Greenspread Projects BV (subject to reservation, provided acceptance by EU)	GREE	NL
13	Sanquin (subject to reservation, provided acceptance by EU)	SANQ	NL
14	AEB Exploitatie BV	AEBE	NL
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ABSTRACT

The City-zen Roadshow travels with a team of internationally recognized experts, in the field of energy planning and design to help develop a sustainable agenda for cities and their neighbourhoods. It will visit 8 cities in total over a 4-year period who are seeking expert guidance on how to become more sustainable and wish to move towards energy neutrality. The overall aim of the Roadshow team, known as 'Roadies', is to work closely with people from the hosting city, whether they be city leaders, energy planners, local architects, professionals, academics, students and of course the citizens themselves. The Roadshow spends 5 days in each hosting city to deliver energy and urban design workshops in which all local stakeholders are welcome and encouraged to join and to take ownership of the final outcomes. Outcomes that will allow the cities recourses, both people and energy, to be directed effectively, by highlighting the energy challenges and potentials to be found in their neighbourhoods, and to finally present a sustainable 'City Vision'.

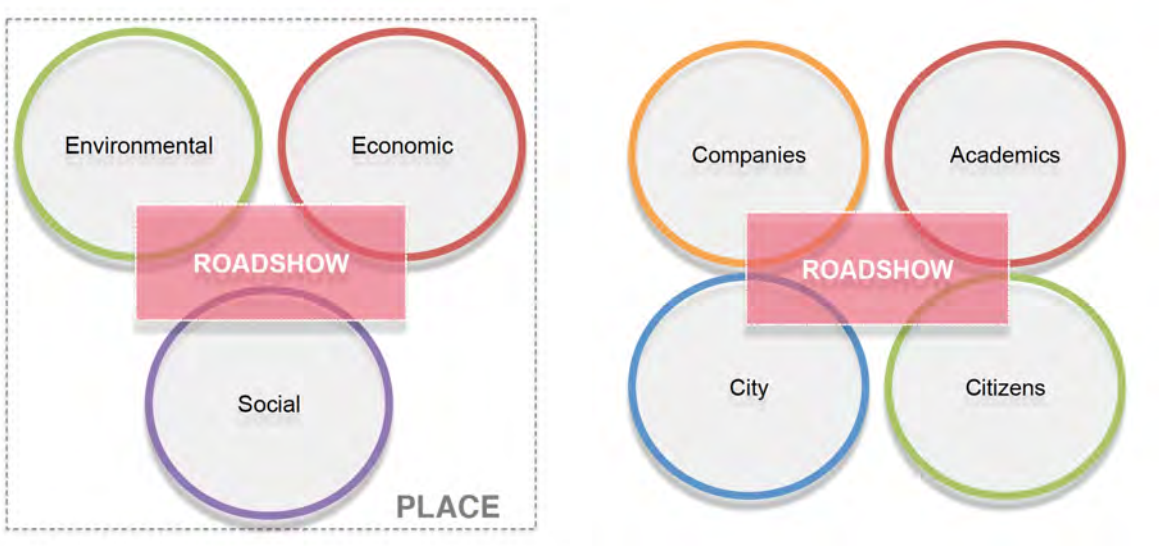
The following report will describe the activities and outcomes of the Roadshow that took place in Bornova, a municipality of the city of Izmir (Turkey) between the 4th & 8th of April 2016.

TABLE OF CONTENTS

CHAPTER 1 – Introduction

1.1. BACKGROUND

This report will describe the Bornova (Izmir) Roadshow, the methods undertaken, and the 'City Vision' that resulted. A Roadshow brings various city stakeholders together to work closely with international experts in the field of sustainability in order to jointly propose a sustainable vision (*Fig 1*). City engagement is an exciting, but challenging prospect. Many questions arise at the beginning of this Roadshow journey, it is far from an exact science to get to a meaningful and agreed vision. Any proposal must have the power to inspire and potentially be advanced and realised beyond any Roadshow 5-day visit. So, who are 'the City'? What are the city's sustainable expectations and current position? What is the energy demand, current and future? Where are the urban challenges, are they purely energetic, spatial or a combination of both? Does 'the City' even realize or accept they have challenges, despite its willingness to be sustainable and to collaborate?



(a) *(b)*

Fig. 1. *(a) The Roadshow investigates environmental, economic and social aspects of each Roadshow city to develop a 'City Vision' that is specifically tailored to respond to place. (b) The Roadshow team brings together all stakeholders, it facilitates this 5-day event to propose a sustainable 'City Vision' that is 'owned' by the city itself.*

To answer these, and many other questions, the Roadshow team began a process of identifying the cities that need and want our advice. The Izmir city municipality of Bornova would follow the City of Belfast to be the next Roadshow hosting city. This process of first contact will be described in CHAPTER 2. This primarily describes an educational workshop studio that occurs in the months leading up to the Roadshow, known as the SWAT Studio. This workshop gives the opportunity for an extended and detail discussion with city leaders and actors. CHAPTER 3 describes the 5-day methodology on a day-to-day 'themed' basis that facilitated an evolution of a vision in which expert input was delivered at key points throughout the five days. CHAPTER 4 will visually communicate what activities and input took place during the Roadshow. It must be noted that a Roadshow is not intended to be a one-way street of information and ideas; the Roadies openly invite 'the City' to present current and future design proposals and energy strategies. The Roadshow goes out of the studio into the community to see

various initiatives and to meet with their members. The final outcomes of the Roadshow are graphically presented in CHAPTER 5, this describes design strategies and detail proposals that are qualitatively spatial and quantitatively energy focused, both combining to make the vision itself.

The Roadshow travels to cities that have diverse climates, urban typologies, economies, cultural backgrounds. It also engages with ambient political landscapes that at times are complex and challenging, as with the previous Roadshow in Belfast, Bornova would be no exception.

1.2. ROADSHOW AIMS

Roadshow 'Aims':

- The City-zen Roadshow travels the length and breadth of Europe to define sustainable visions for cities, its neighbourhoods & citizens.
- In total, 8 cities will be visited over the next 4 years, each Roadshow consisting of a 5-day event in which a Roadshow methodology/format will be implemented. The experiences of each Roadshow will advance the methodology, which in itself will be a deliverable that can be used on all cities in the future to help define a city's sustainable vision.
- That the sustainable 'City Vision' helped defined by the Roadshow methodology comes from, and fully belongs to, the city itself. City vision ownership is critical, as a city vision developed exclusively by the Roadshow team, and not by the multidisciplinary city stakeholders, would physically and metaphorically leave with the Roadshow as it moves onto the next city.

1.3. GOALS

The City-zen Roadshow has the following goals:

- To engage with citizens in each host city. Once specific sites/zones are earmarked for city and Roadshow intervention the community leaders and associations belonging and active in those areas will be invited to participate with the projects and tasks of the 5-day event.
- To identify, reach and collaborate with city 'decision makers'. To exchange knowledge with all parties and to involve students in the process, both in pre-Roadshow preparation (SWAT Studio, Energy data from WP4).
- To build a network of Roadshow host cities and scientific community.

General goals:

- Contribute to the Lighthouse idea, to convince the audience that the demonstration is innovative and contributes to the sustainability targets (EC objective).
- To promote City-zen as a leading project in the EU (consortium-wide objective).
- Engage with the audience through follow-up activities (consortium-wide, ASC objective)

1.4. TARGET AUDIENCE

Citizens:

- The most important target group is citizens in neighbourhoods of the host city. Citizens are defined by the Roadshow as community leaders/influencers & decision-makers.

Business & industry:

- Industry is encouraged to co-visit the cities during the Roadshow.

Students:

- The Roadshow and pre-Roadshow (SWAT Student Studio) will engage with students from the academic institutions from the hosting cities. 600 students across the EU by visiting local universities during the Roadshows (City-zen deliverable).

Housing Corporations:

- The Roadshow offers possibilities for direct contact, knowledge and experience exchange, between the City-zen team and EU colleagues.

Cities:

- Potential new cities and past Roadshow cities. This could occur through invitation to 'final day' Roadshow city vision presentations. This potential network being a catalyst for further reaching/wider community of European cities.

Decision makers:

- Target a face-to-face experience and knowledge exchange of another 450 decision makers (together with field visit and serious role playing game) (City-zen deliverable).

CHAPTER 2 – FIRST CONTACT: Pre-Roadshow Preparation (SWAT Studio)

2.1. WHAT IS SWAT?

SWAT (Sustainable Workshop Architecture & Technology) is a student workshop where Building Technology students from the Delft University of Technology (TU Delft) develop and propose in groups innovative, sustainable and contextually responsive urban design interventions. It is the precursor event to the Roadshow. In Bornova, at the University of Yasar, SWAT forged pre-Roadshow relationships with key city stakeholders, allowing project sites to be evaluated and selected, and timetables and studio venues to be organised in advance of the Roadshow.

In collaboration with students and staff from the University of Yasar (Bornova) the sustainable urban design workshop was successfully completed and the output of which was presented on DAY 1 of the Roadshow. The SWAT Studio made positive connections with Bornova's municipality leaders, stakeholders, academics and sustainable energy entrepreneurs (Onur Enerji).

A key ambition of the workshop is always to demonstrate that, through building interventions at all scales ranging from façade, building, street, neighbourhood and district, that sustainable lifestyles are possible within existing cities.

AIMS:
- Engages with Roadshow City in advance of Roadshow (typically 1.5 months before DAY 1 of Roadshow.
- To produce technological responses of merit informed by urban context.
- To visually demonstrate that Climate, Façade and Structure are mutually dependent specialisms capable of generating sustainable city form at all scales and latitudes.
- To demonstrate that sustainable lifestyles are possible within existing cities.

2.2. SWAT IN BORNOVA 22/02/16 – 04/03/16

The following figures (2 to 4) represent the outputs and collaborations during the Izmir SWAT Studio:

(a) The 3 SWAT project sites.

(b) The Roadshow site, an extension to the SWAT locations.

Fig. 2. *Selection of SWAT Workshop design proposals outlining future visions for Bornova, Izmir.*

(a) Pedestrian only streets with cooling strategies for street and façade.

(b) 'Themed' Public spaces with water cooling and collection.

(c) The Solar Decathlon project located immediately below and to the edge of the Roadshow project site at 'Ataturk Mahala'.

Fig. 3. *Selection of SWAT Workshop design proposals outlining future visions for Bornova.*

(a) Dr Ilker Kahraman, Vice Dean of the Faculty of Architecture (Yasar University) offers advice the SWAT students. Dr Kahraman was to be a key planner of the forthcoming Roadshow.

(b) Onur Gunduru from Onur Enerji presents 'The Bricker Project' to the SWAT Studio on location at the Bricker hospital site. Onur would later present the 'Future Technologies' lecture at the Roadshow.

(c) The final SWAT projects presented to an audience including municipality leaders, the Dean and Vice Dean of the University, academics, Yasar University students and other invited guests.

Fig. 4. *SWAT Studio on location at Yasar University and the sustainable retrofit 'The Bricker Project' (The Turkish University Hospital).*

CHAPTER 3 – The Roadshow '5-Day' Methodology

3.1. FIVE DAYS

Figures 5 to 8 graphically illustrates the 5-day Roadshow that took place in early August 2016 in Bornova. As can be seen under the 'Pre-Roadshow Analysis', the SWAT Studio began one month prior to the Roadshow start. Both the SWAT and the Roadshow were designed to be intensive events that optimized 'time', 'communication & explanation', 'local city participation' and 'outcomes'. Components (lectures, site excursions, design workshops and mini-masterclasses) within the 5 days were timed at key points within the 5 days in order to derive key sustainable propositions and to evaluate them. The outputs, which were synchronised with specific Roadies specialisms in energy and urban design, were both qualitatively spatial and quantitatively energy focused, and combined to form the City Vision on the final day (DAY 5).

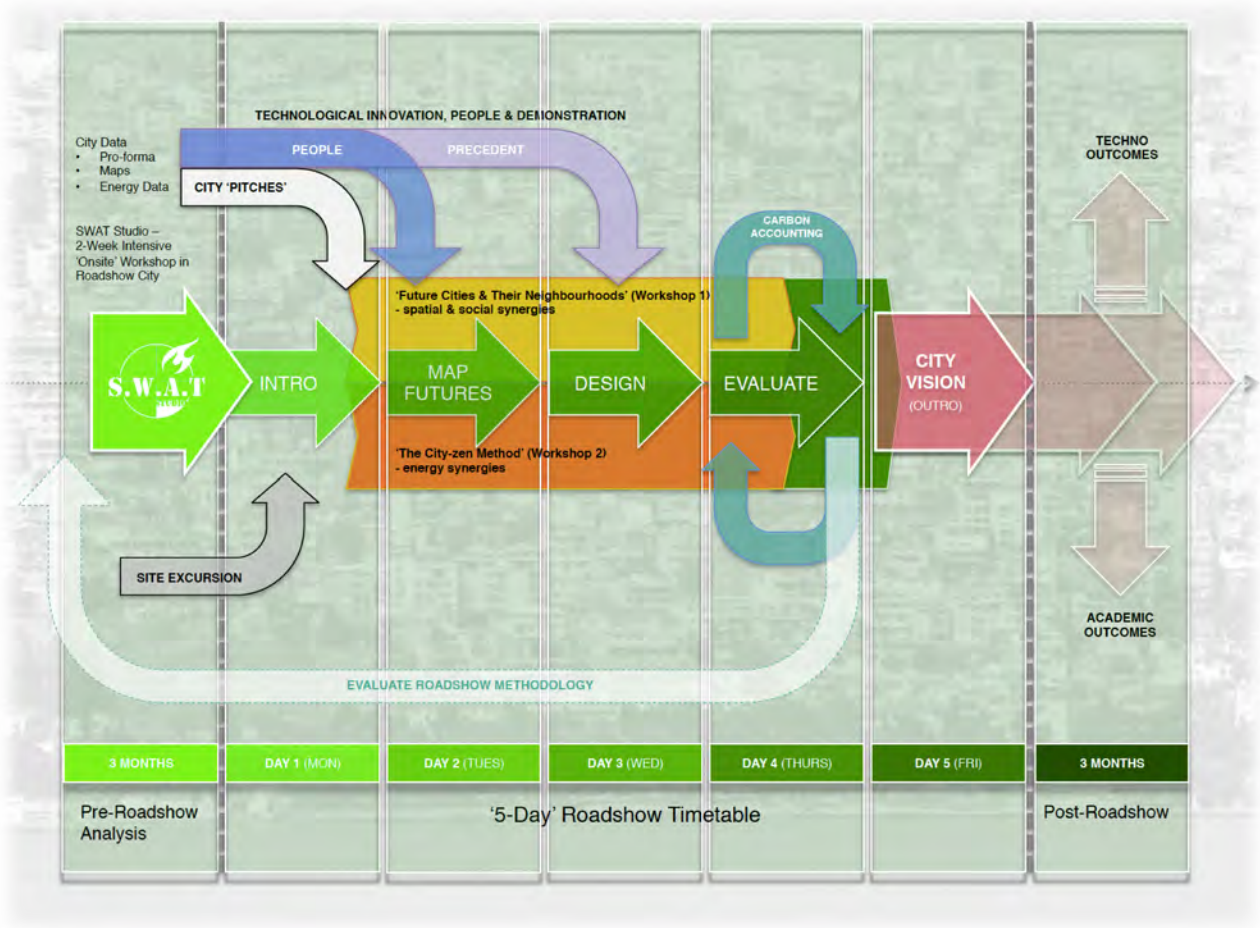


Fig. 5. *The Bornova (Izmir) Roadshow 5-day schedule. The outcomes of the SWAT Studio being the starting point of the Roadshow.*

DAY	Morning/ Afternoon	Time	ACTIVITIES	VENUE / NOTES
DAY 1 04/04/16 (Mon) Theme: 'INTRO'	AM	10:00 - 10:30	MEET & GREET (Villa Levante Hotel, Bornova)	NOTES:
		10:30 - 12:00	'MINI-BUS' EXCURSION AROUND BORNOVA SITE	
			LUNCH	
	PM	12:30 - 12:45	'Welcome to the Bornova Roadshow' by Dr Ilker Kahraman, Yasar Universitesi (VENUE: Yasar Universitesi)	
		12:45 - 13:00	'The Roadshow Methodology' (5-Day Format) by Dr. Craig L. Martin, Delft University of Technology (TUD)	
		13:00 - 13:15	'Future Cities & Their Neighbourhoods' (Workshop 1) by Prof. Greg Keeffe (QUB)	
		13:15 - 13:30	'The City-zen Method' (Workshop 2) by Prof. Andy van den Dobbelsteen & Siebe Broersma (TUD)	
		13:30 - 13:45	'Bornova Roadshow' ANY QUESTIONS? by Roadshow Team + BREAK	
		13:45 - 14:00	'The Best of Bornova SWAT Studio 2016' by Dr Craig L. Martin (TUD)	
		14:00 - 14:05	WELCOME & INTRODUCTION IZMIR 'Pitches' by Dr Ilker Kahraman, Yasar Universitesi	
		14:05 - 17:30	Izmir & Bornova Project Presentations by 'The City'	
		17:30 - 18:00 +	End of DAY 1 SUMMARY: INFORMAL DRINKS & DISCUSSION — ALL WELCOME!	
		20:00 - 12:00	EVENING DINNER (Venue t.b.a.)	
DAY 2 05/04/16 (Tues) Theme: 'MAP FUTURES'	AM	09:15 - 09:30	COFFEE & MEET UP POINT	
		09:30 - 10:30	Mini-Masterclass 1 - 'THE LINK BETWEEN PEOPLE & TECHNOLOGY' by Dr Han Vandevyvere (VITO)	NOTES:
		10:40 - 11:00	BREAK	
		11:00 - 12:00	'Future Cities & Their Neighbourhoods' (Workshop 1) PERIOD 1 — 'The City-zen Method' (Workshop 2) PERIOD 1	
			LUNCH	
	PM	12:30 - 13:50	PERIOD 2 — PERIOD 2	
			BREAK	
		14:00 - 16:20	PERIOD 3 — PERIOD 3	
			BREAK	
		16:30 - 17:00	DAY 2 'MAP FUTURES' SUMMARY + WORKSHOP 1 & 2 'CATCH-UP' — ALL WELCOME!	
		20:00 - 12:00	EVENING DINNER (Venue t.b.a.)	
DAY 3 06/04/16 (Wed) Theme: 'DESIGN'	AM	09:15 - 09:30	COFFEE	
		09:30 - 10:30	'Future Cities & Their Neighbourhoods' (Workshop 1) PERIOD 4 — 'The City-zen Method' (Workshop 2) PERIOD 4	NOTES:
		10:30 - 10:40	BREAK	
		10:40 - 12:00	PERIOD 5 — PERIOD 5	
			LUNCH	
	PM	12:30 - 14:00	'FUTURE TECHNOLOGIES' Seminar by Onur Gundura (Onurenerji) & Leen Peeters (Thinke)	
			BREAK	
		14:10 - 16:20	PERIOD 6 — PERIOD 6	
			BREAK	
		16:30 - 17:00	DAY 3 'DESIGN' SUMMARY + WORKSHOP 1 & 2 'CATCH-UP' — ALL WELCOME!	
			END	
DAY 4 07/04/16 (Thurs) Theme: 'EVALUATE'	AM	09:15 - 09:30	COFFEE	
		09:30 - 10:30	Mini-Masterclass 2 'CARBON ACCOUNTING EXPLAINED' By Riccardo Pulselli (University of Sienna)	NOTES:
		10:40 - 12:00	BREAK — PERIOD 7 — PERIOD 7	
			LUNCH	
	PM	12:30 - 13:30	FINAL AGREEMENT & DISCUSSION of CITY VISION — ALL WELCOME!	
		13:30 - 13:40	BREAK	
		13:40 - 14:20	FINAL AGREEMENT & DISCUSSION of CITY VISION (Cont...) — ALL WELCOME!	
			BREAK	
		14:30 - 15:00	DAY 4 'EVALUATION' SUMMARY + WORKSHOP 1 & 2 'CATCH-UP' — ALL WELCOME!	
			END	
DAY 5 08/04/16 (Fri) Theme: 'OUTRO'	AM	09:30 - 10:00	WELCOME COFFEE	NOTES:
		10:00 - 10:15	'WELCOME TO THE BORNOVA ROADSHOW' by Dr Ilker Kahraman, Yasar Universitesi	
		10:25 - 10:30	SHORT BREAK	
		10:30 - 11:15	'THE CITY VISION' Presented by BORNOVA (IZMIR)	
		11:15 +	ROADSHOW DISCUSSION DRINKS & CLOSURE	
	PM +		FINISH	

Fig. 6. *The Bornova (Izmir) Roadshow 5-day timetable. The 'Technical Tradeshow' timetabled for Day 2 in the previous Belfast Roadshow was removed from the schedule. All other components of the Roadshow would be successfully completed, including the 'Future Technologies' lecture, which did not take place in Belfast but in Izmir would be kindly prepared presented by Onur Gundura from Onur Enerji.*

(a) Prof. Greg Keeffe (Queens University Belfast, UK) presents 'Workshop 1' to the attending stakeholders.

(b) Emre Yontem (Head of R&D Group at Turkey based company 'ekodenge') presents his company's current and future sustainability plans. Other stakeholders also presented during the 'Izmir Pitches' afternoon session on DAY 1.

(c) Siebe Broersma (Delft University of Technology) presents 'Workshop 2' to the attending stakeholders.

(d) Prof. Andy van den Dobbelsteen (Delft University of Technology) continues to discuss the theory and practice behind 'Workshop 2'.

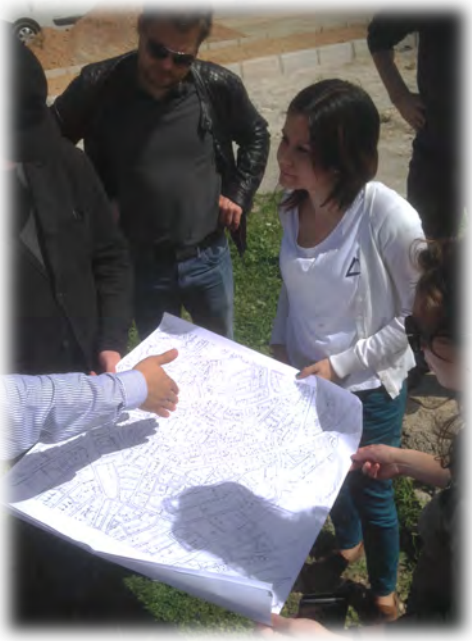
Fig. 7. *Introductory 'Pitches' on DAY 1, Venue: The Faculty of Architecture, Yasar University (Bornova). 'Pecha Kucha' presentations by the Roadies inform the Roadshow audience of what will take place over the next 5 days. Bornova's stakeholders also contributed on the day with formal and informal presentations and introductions.*

(a) Roadshow project site at Ataturk Mahallesi. A mainly residential area with illegally built upper floor extensions to most properties.

(b) Architecture students from Yasar University have a briefing with members of the Roadshow team to discuss the tasks for each Workshop.

(c) The studio base at the Bornova Archive & Museum is a hive of activity on DAY 1.

(d) Mini-Masterclass 1 - The Link between People and Technology is underway.



(e) Maps, site orientation and local knowledge help the Roadies understand the place.

(f) A local stakeholder explains how his family's house was constructed in detail. He goes on to describe the level of insulation in each of the properties within the Mahallesi.

Fig. 8. *Images describing daily Izmir Roadshow activities. Upper images show activity in the Bornova Archive & Museum, a venue kindly donated by the Municipality of Bornova to the Roadshow, this would be the HQ base of the Roadshow for the 5 days. The lower images show the Roadshow on the site Excursion (Morning of DAY 1).*

Fig. 9. *Ataturk Mahallesi has a commanding view of Izmir from its plateau position above the city. Here, there is time for an impromptu picture before boarding the coach kindly donated by the Municipality of Bornova.*

CHAPTER 4 – Daily Activities & Roadies 'Out & About'

4.1. DAILY ACTIVITIES

Architects, Municipality members, PhD students, academics and energy consultants visited the Roadshow HQ at the Bornova Archive & Museum each day. The 5-day programme was devised in such a way to encourage participants to 'drop-in' and 'drop-out' so that the Roadshow Workshops and Mini-masterclasses could fit into their professional and family schedules, a strategy that would increase city involvement and bolster involvement later in the week (*Fig 10*).

Fig. 10. *The intensive environment of the Roadshow studio at the Bornova Archive & Museum. Coloured marker pens, rolls of tracing paper, laptops and notebooks are the tools of choice for the Roadshow participants. Workshops 1 & 2 work in parallel throughout the day, Stakeholders migrate from one workshop to the other to get a full overview of energy and urban theories and their implementation. At intervals throughout the day both workshops come together to summarise their findings and to agree on the next steps.*

4.2. ROADIES 'OUT & ABOUT'

The Roadshow is an intensive environment where time is limited. However, the Roadies make every effort to break from the studio workshop sessions to go out into the community and promote sustainability and the City-zen project. Following on from the Belfast Roadshow's visit to a secondary school (St Colm's High School, Colin, Belfast), Roadies visited the architecture students of Yasar University to give lectures on urban sustainably and to describe the latest developments of DAY 4 of the Izmir Roadshow (*Fig 11*).

Fig 11. *On DAY 4 of the Roadshow Prof. Greg Keeffe & Dr. Craig L. Martin visit the Yasar University campus to disseminate the Izmir Roadshow to the architecture students of Yasar.*

CHAPTER 5 – WORKSHOPS & MINI-MASTERCLASSES: Aims, Methodology & Outcomes

5.1. INTRODUCTION

Through multidisciplinary group working and interactive sessions, the Bornova Roadshow would both engage city stakeholders with innovative technologies and creative urban interventions, with a wider aim of facilitating the development of a sustainable city strategy plan. 'Drop in' sessions allowed participants to become familiar with practical technologies and their applications, as well as their strategic implications during the design process. Travelling with the Roadshow would be an experienced team of internationally renowned sustainability experts, whose specialisms combined with multidisciplinary stakeholder groups and students from Izmir (*Fig 12*).

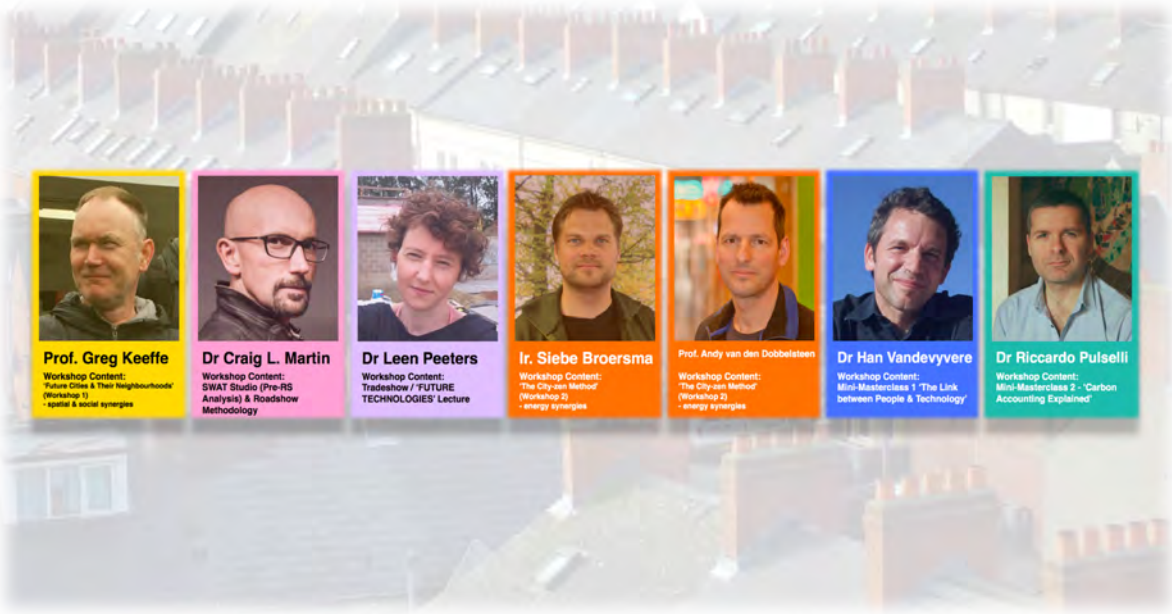


Fig 12. *The Roadshow team, known as the 'Roadies'.*

The Roadshow used 2 contextually dependent approaches, which manifested themselves into 2 parallel workshops, one focusing on energy synergies, the other being a creative design project that responded to spatial & social questions. These approaches would overlap during each day to develop a holistic 'City Vision', 'owned' by the city. Specialists in the field of technology uptake (Mini-Masterclass 1), Carbon Accounting/evaluation (Mini-Masterclass 2) and Future Technologies (Lecture) would supplement the workshops at key intervals throughout the 5 days (*Fig 13 overleaf*).

Fig 13. *The Roadshow Mini-Masterclass 2 'Carbon Accounting Explained' and 'Future Technologies' lecture being delivered in the Roadshow studio HQ at the Bornova City Archive & Museum. Upper images show Dr. Riccardo Pulselli (University of Sienna) delivering Mini-Masterclass 2, here Riccardo is comparing the energy consumption of Belfast (the previous Roadshow City) with that of Izmir. The lower images depict Mr. Onur Gundura from Izmir/Turkey based company 'OnurEnerji' delivering the 'Future Technologies' lecture, Onur went onto summarise the sustainable technologies currently being developed nationally to meet Turkey's need.*

Architecture Students from Yasar University, who successfully participated in the Izmir 'SWAT Studio' in February 2016 would act as 'facilitators' for each workshop. Facilitators support the workshop with visualizations and calculations. This Chapter will summarize Workshops 1 & 2 which took place over the 5 days.

5.2. WORKSHOP 1: 'FUTURE CITIES & THEIR NEIGHBORHOODS' - SPATIAL & SOCIAL SYNERGIES

Introduction

Workshop 1 would run throughout the 5 days in Bornova, its daily aim being to inspire people to imagine a more sustainable future, one that embraces the best of new technology in a way that is life-enhancing. The workshop would encourage free-thinking open-ended discussions about how things should be.
The workshop engaged stakeholders with new ideas for how we will live in the future. It would imagine new lifestyles and then develop strategies to achieve these that open up possibilities for communities to change the way they live. The workshop began with an envisioning session about the future, and quickly moved onto designing the infrastructure necessary to achieve these visions. Once the infrastructure was developed, a phased strategy would be proposed to achieve these goals.

1. Task 'Aim' & 'Objectives'

The design part of the Roadshow has clear objectives in that it aims to kick-start carbon descent through the development of a series of options for the neighbourhood. The scope was holistic and arguably over challenging for a typical consultancy team to resolve, however the Roadshow team offered a service that is unmatched currently.

2. Workshop Outcomes

The workshop identified local and global challenges, and responded to them at varying scales under 5 infrastructural themes; Mobility, Green, Energy, Water and Food. At the street scale, studies highlighted current anti-pedestrian features such as dangerous crossroads, unused and ineffective pedestrian routes, lack of pavements and green in family parks etc. It was concluded that the pedestrian is disadvantaged at every scale in favour of the car. This challenge would later be met by two green infrastructural routes that promoted green, passive and active solar technologies, bike/electric public vehicles and pedestrian use. It was emphasized that sustainable urban design occurs at several scales, and can be encouraged by creating a series of policies that embody good behaviour, leading to form within the existing context.

The 'City Vision' accepted that illegal development is impossible to prevent in Izmir, so it must be worked with by residents to build sustainable infrastructure for the city. Here, compliance would be granted to people who create common benefits. One example being the implementation of a 'Land Swap' strategy where small vacant land parcels in the city would be swapped with city-owned land elsewhere, more suitable for development. These small land parcels, known as 'pocket parks', would be developed into green infrastructure that includes:

- water storage
- public space
- play space
- green refuge
- transpirational anti-heat island

Every resident should be within 200 metres of a 'pocket park'.

For a graphical and detail description of design outcomes (façade, roof, street and housing block interventions) see Chapter 6 'The City Vision'.

5.3. WORKSHOP 2: 'THE CITY-ZEN METHOD'

Introduction

The aim of Workshop 2 was to make an Energy Master Plan for the neighbourhood of Atatürk Mahallesi; to identify existing and implementable sustainable interventions and actions that lead the area to a high level of sustainability. The objectives were to map demand and sustainable energy potentials for the area, analyse the region on social, political and economic climate, select potential suitable measures and find fitting locations and timelines to integrate them. The format of the workshop was an interactive workshop that ran for the full 5 days with specialists, local authorities and students.

1. Task 'Aim' & 'Objectives'

The goal of the energy part of the Roadshow team was to define suitable energy interventions that fit the neighbourhood or city. These would be based an understanding of local energy potentials, the social, economic and politic circumstances.

2. Methodology

In Work Package 4 (WP 4) of the City-zen project, a general urban energy transition methodology is being developed this is based upon previously established methodological frameworks such as energy potential mapping, carbon accounting, multimodal system analysis and integrated urban planning concepts. A shortened version of this methodology was applied within workshop 2 allowing the WP4 methodology to benefit from Roadshow experiences.

3. Workshop Outcomes

The outcomes of workshop 2 would be future energy scenarios outlining for Atatürk Mahallesi neighbourhood. Energy efficiency measures (building retrofit) would be being combined with renewable energy provision and storage in a mutually coherent strategy. Each combination of energy measures was quantified and dimensioned for the specific location; starting from initial energy demand and CO_2 emissions (step 0), and ending with full zero-energy systems. The scenarios are finally connected with a vision of integrated sustainable urban development. All scenarios will be graphically illustrated in Chapter 6 'The City Vision'.

CHAPTER 6 – THE CITY VISION

6.1. FINAL PRESENTATION (BORNOVA MUNICIPALITY)

The final day of the Bornova (Izmir) Roadshow took place in Municipality Conference in Bornova on the 8th of August 2016. The final 'City Vision' presentation was presented to an audience comprising Bornova's Municipality leader's, academic leaders, professionals, students and invited guests from the Bornova area. The Mayor of Bornova would visit the final proceedings and present the Roadies with small gifts of gratitude.

Fig 13. *The Final 'City Vision' presentation event (DAY 5) at The Bornova Belediyesi building. Left image show's Dr. Craig L. Martin beginning the 'City Vision' presentation by describing the City-zen project and the Roadshow events and activities that were undertaken over the 5-day period. The 'City Vision' would end with an in-depth debate between all the stakeholders and Roadshow team.*

The 'City Vision' would take the form of three overlapping presentations. The first presentation went onto outline the objectives of the City-zen project generally, and specifically the ambitions and format of the Roadshow. The second presentation described the results of Workshop 1. The content would be qualitative in nature and included urban planning intervention proposals at the neighbourhood scale, spatial, social and building regulation strategies. The third and final presentation would be more quantitative focused on energy strategies, energy scenarios and carbon footprinting evaluations. Members of the Roadshow team intend to follow-up the 'City Vision' post-Roadshow, though it must

be noted that the political circumstances in Turkey have changed considerably since the Roadshow ended, this will be monitored in the coming months.

6.2. CITY VISION (THE PRESENTATION)

The 'City Vision' presentation delivered at The Bornova Belediyesi building on the 8th of August 2016 can be found hereafter.

‘The Bornova (Izmir) Roadshow’

4th April to 8th April 2016

The Bornova City Archive & Museum & Yasar Universitesi

For more information on how to get involved with the Bornova (Izmir) Roadshow, and to contribute to a sustainable City Vision contact:

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Izmir Contact.
Dr Craig L. Martin, Delft University of Technology (c.l.martin@tudelft.nl)
Roadshow Coordinator
See link: http://www.cityzen-smartcity.eu

CITYZEN INVOLVEMENT

The goal is to **motivate** and **empower end-users** to a long term energy saving attitude via:

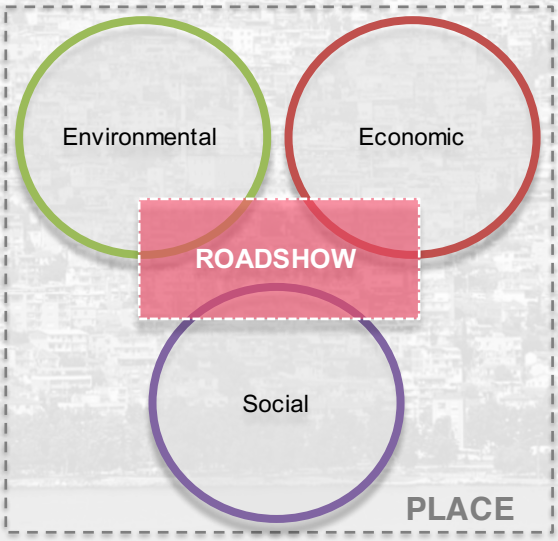
- serious games
- an energy savings challenge
- monitoring their own energy
- retrofitting houses
- usage of district heat and cold sources
- using an electrical car to store energy
- using home batteries to increase self consumption of solar power

• Roadshow

1. THE ROADSHOW

BACKGROUND

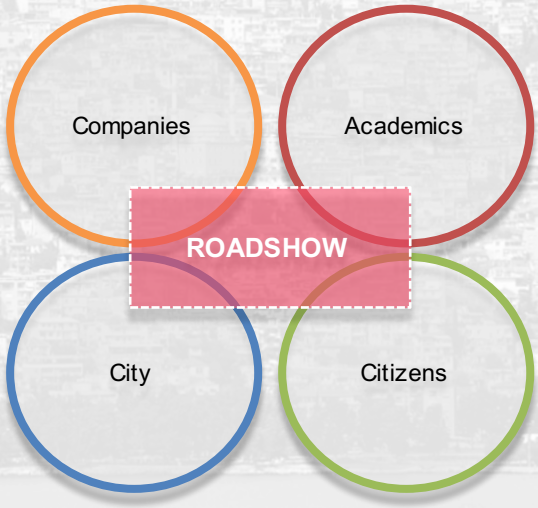
- Context for roadshow: The Trias Energetica



1. THE ROADSHOW

BACKGROUND

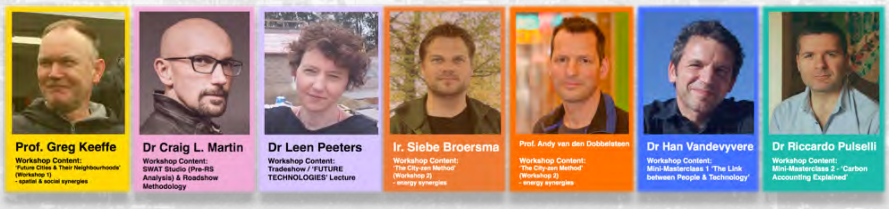
- Context for roadshow:



1. THE ROADSHOW

THE 'ROADIES':

- Travelling with the Roadshow is an experienced team of internationally renowned sustainability experts, whose specialisms will combine with multidisciplinary stakeholder groups and students from each hosting city.



1. THE ROADSHOW

BACKGROUND

- Roadshow activities & events over the 5 Day programme include:

  Energy Mapping

  Design workshops

  Mini-Masterclasses

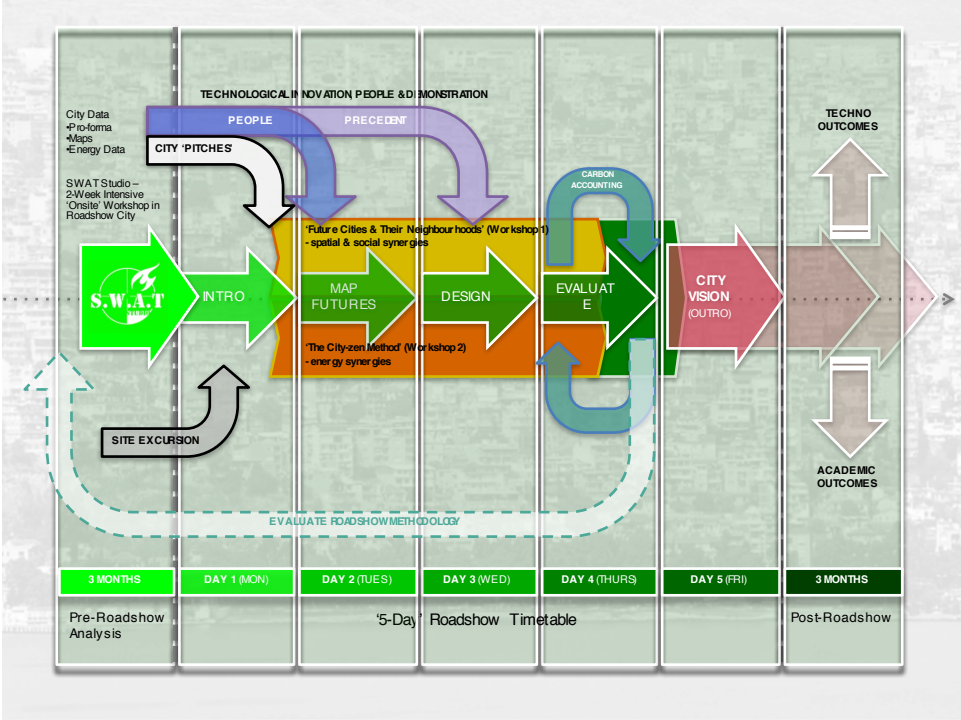
  Future Innovation Technology lectures

  Tradeshows

  Carbon Accounting

  Serious Gaming

  ITS NOT A COMMUNITY CONSULTATION SESSION!


TECHNOLOGICAL INNOVATION PEOPLE & DEMONSTRATION
City Data
•Pro-forma
•Maps
•Energy Data
PEOPLE
PRECEDENT
CITY 'PITCHES'
SWAT Studio –
2-Week Intensive
'Onsite' Workshop in
Roadshow City
CARBON ACCOUNTING
TECHNO OUTCOMES
'Future Cities & Their Neighbourhoods' (Workshop 1)
- spatial & social synergies
S.W.A.T
INTRO
MAP FUTURES
DESIGN
EVALUATE
CITY VISION
(OUTRO)
'The City-zen Method' (Workshop 2)
- energy synergies
SITE EXCURSION
ACADEMIC OUTCOMES
EVALUATE ROADSHOW METHODOLOGY
3 MONTHS
DAY 1 (MON)
DAY 2 (TUES)
DAY 3 (WED)
DAY 4 (THURS)
DAY 5 (FRI)
3 MONTHS
Pre-Roadshow Analysis
'5-Day' Roadshow Timetable
Post-Roadshow


1. The roadshow – DAILY ACTIVITIES

1. The roadshow – DAILY ACTIVITIES

The roadshow – DAILY ACTIVITIES

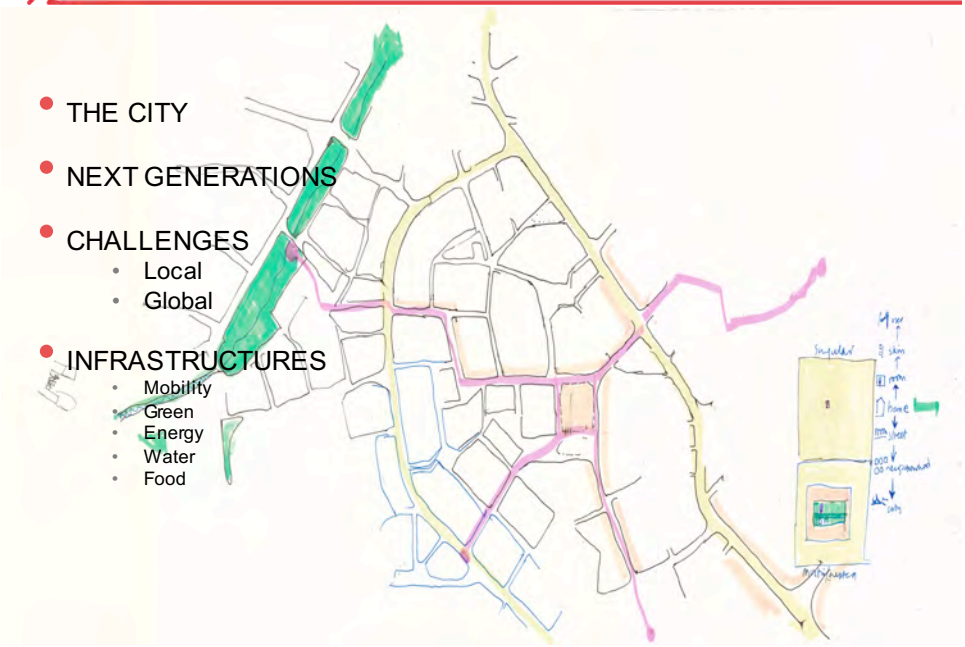
- Impactful Academic, Technical & Societal Outcomes
- Final Presentation to a High-ranking Audience
- Methodologies for design collaborations & working processes
- A City agenda, not a blueprint.
- A ‘City Vision’, facilitated by the Roadshow, but holistically ‘owned’ by the City and its citizens.

CITY VISION

Future Cities & Their Neighbourhoods' (Workshop 1)
- spatial & social synergies

THE CHALLENGE

- THE CITY
- NEXT GENERATIONS
- CHALLENGES
  - Local
  - Global
- INFRASTRUCTURES
  - Mobility
  - Green
  - Energy
  - Water
  - Food



Dangerous crossroads

Unused pedestrian routes

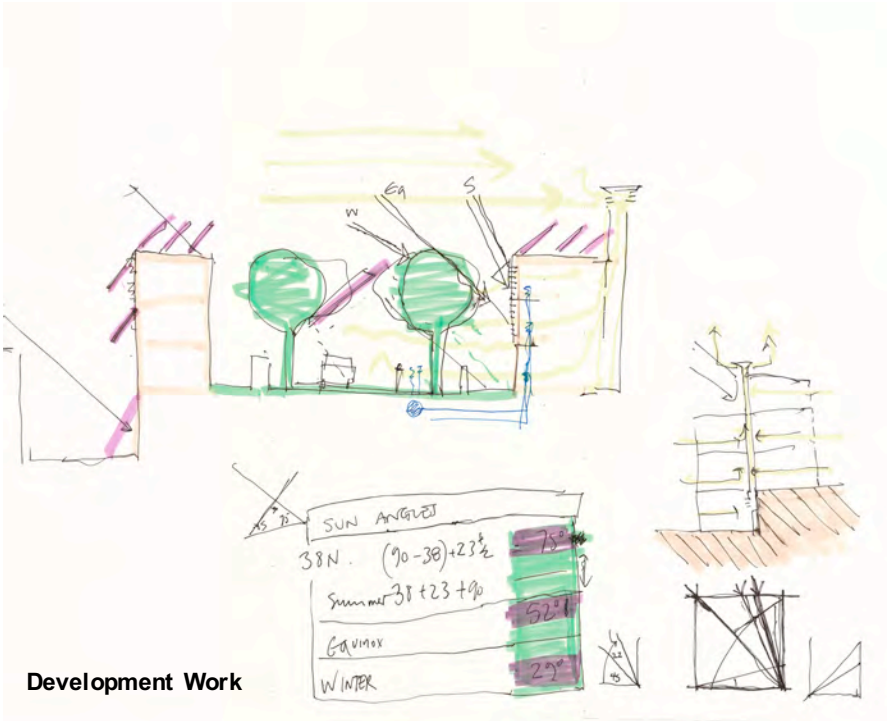
Devoid of pedestrian routes

Ineffective pedestrian routes

No green in family park

Unused potential of green areas

The pedestrian is disadvantaged



Development Work

Development Work

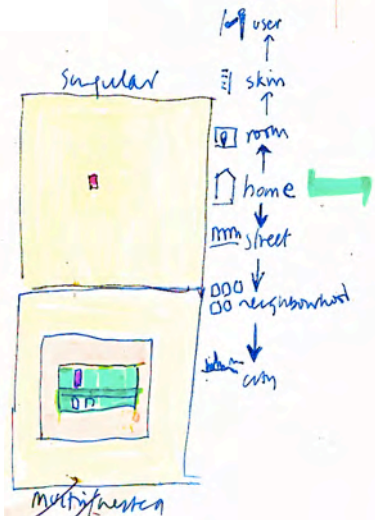
Development Work

Development Work

Development Work

- Urban design happens at several scales,
- Key is at the moment infrastructure.

- Infrastructure comprise Policy and Form creation at various scales.
-
- A main aim is to create a series of Policies that embody good behavior that leads to form within the existing context.



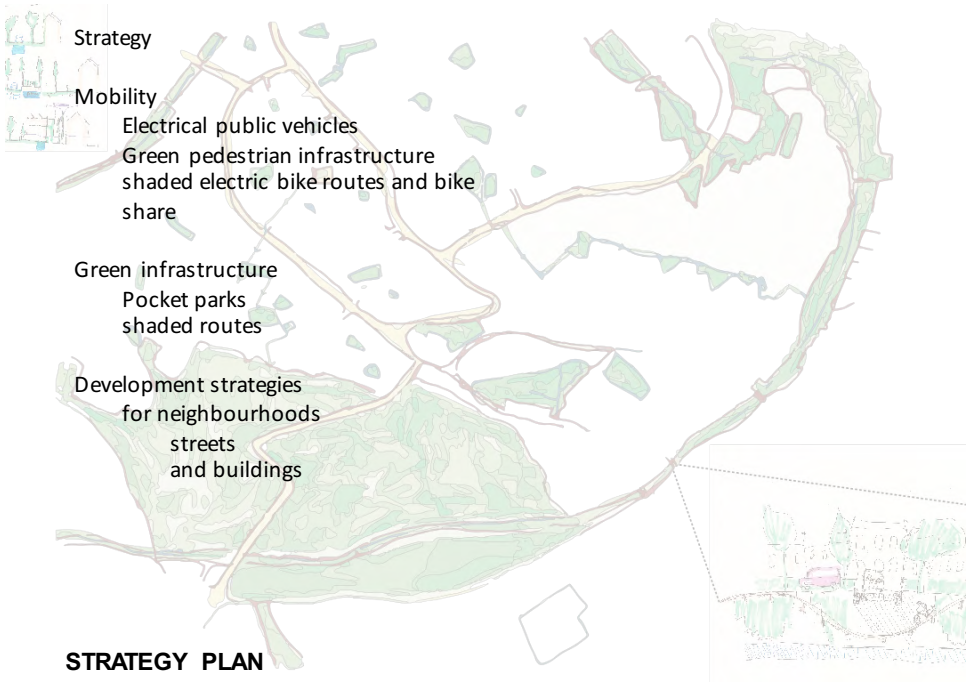
Urban strategy

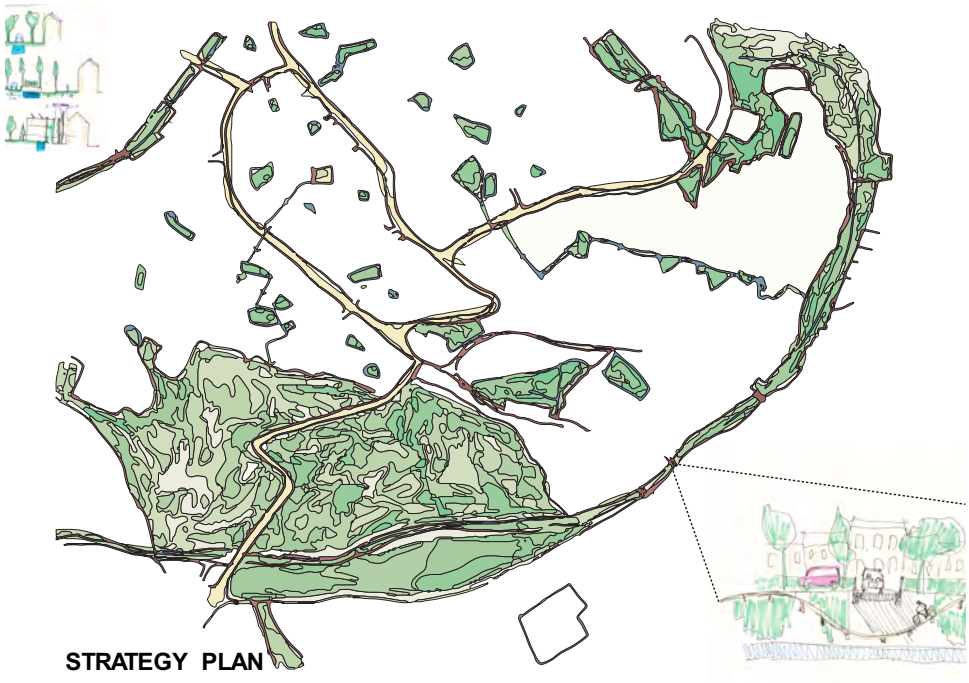
THE AIMS

- RAPID CARBON DECENT
- 5 KEY AREAS BEING:

  A. MOBILITY
  B. ENERGY USE
  C. WATER
  D. FOOD
  E. MATERIALS

- Concrete responsible for Climate Change, Careful management of its use is critical.


Strategy
Mobility
Electrical public vehicles
Green pedestrian infrastructure
shaded electric bike routes and bike share
Green infrastructure
Pocket parks
shaded routes
Development strategies
for neighbourhoods
streets
and buildings
STRATEGY PLAN


STRATEGY PLAN

CITY VISION

Green Block Facade

CITY VISION

‘Illicit planning gain’ - Energy Amnesty

Illegal development is impossible to stop…

So work with it by getting residents to build sustainable infrastructure for the city.

Compliance granted to people who create common benefits.

CITY VISION

Block façade existing

CITY VISION

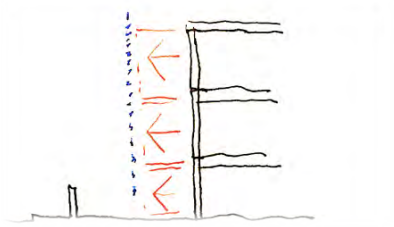
Block façade Legal

CITY VISION

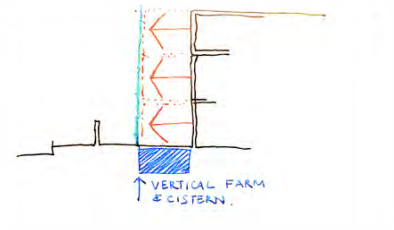
Benign Facades.

Houses can be extended forwards towards the street by 3m if.

1.Residents build a passively-cooled street façade



2.Residents develop a vertical farm façade



The space between the existing house and the façade, can then be occupied by the householder.

CITY VISION

Super-roof

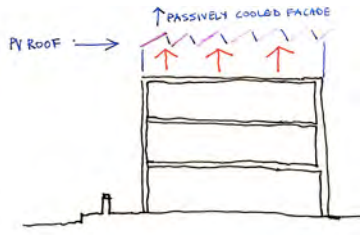
An extra 3 metre height can be gained by:

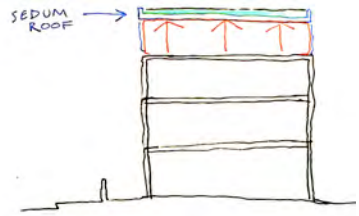
1Building a Photovoltaic roof

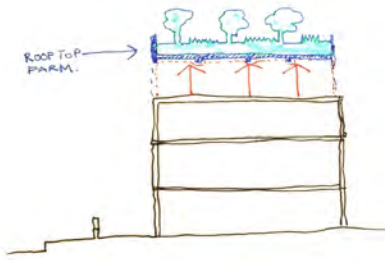
2Installing a sedum or turf roof

3Creating a roof-top urban farm

The space under this new surface can then be occupied by the householder







CITY VISION

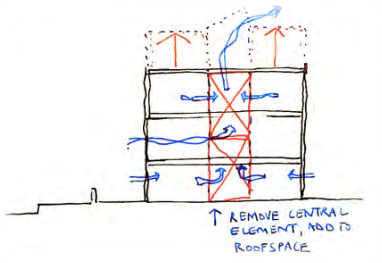
Ventilation voids

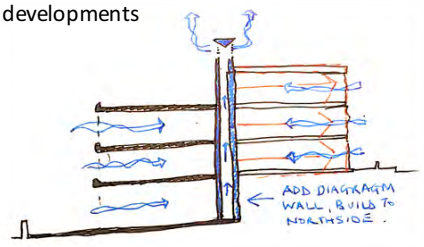
Areas that encourage stack or wind assisted ventilation:

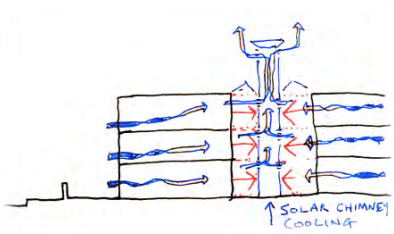
1Can be exempt from planning volumes

1Can be used as occupiable space

1Can be used as structure for back-to-back developments







CITY VISION

Illicit gains.

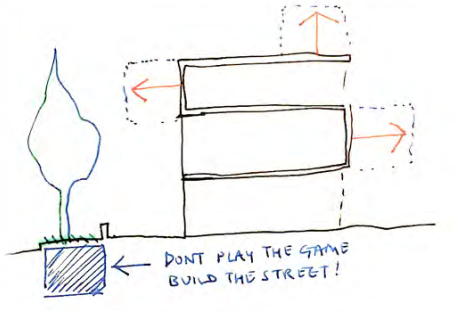
Constructions that do not meet the above, can gain approval through:

1 Street canopy development (street trees)

2 Creating Urban farming infrastructure

3Greening by perforating the street surface

4Cistern construction for grey/rain water storage.



CITY VISION

Block façade existing

CITY VISION

Green Block Facade

CITY VISION

Land swap – green infrastructure

Small vacant land parcels in the city should be swapped with City-owned land elsewhere, more suitable for development.

These small land parcels should be developed into green infrastructure: These 'Pocket parks' will include

1.Water storage:
2.Public space
3.Play space
4.Green refuge
5.Transpirational anti-heat island – super cooler

6.Every resident should be within 200m of a pocket park

Land-swap Pocket park infrastructure


CITY zen
New urban energy
Universiteit van Amsterdam
alliander
vito
vision on technology
aeb
amsterdam
Westpoort Warmte
Ville de Grenoble
Atos
Worldgrid
DNV·GL
GEG
Compagnie de chauffage
SRB
C·L Clicks + Links
DAIKIN
waternet
GREENSPREAD
HESPUL
Queen's University
Belfast
Th!nk E
SIEMENS
TU Delft

Bornova

Energy scenarios

Problem statement

How much energy is being lost,
and how much can we produce on site?

(an example)

EXAMPLE: VENTILATIONLOSSES

A typical Bornova dwelling unit loses 46 kWh/day by ventilation

How much energy is that on a yearly basis, taking into account heating and cooling?

Foodstuff	Energy content (kWh/kg or kWh/l)	Unit	Ventilation losses on yearly basis (120 heating & cooling days)
Chocolate	6.6	chocolate bars	9324
Chips	6.3	bags of chips	5160
Snickers	5.6	Snickers	19680
Pinda	6.9	bags of pinda	4560
Cola	0.5	bottles of cola	10560

EXAMPLE: VENTILATIONLOSSES

A typical Bornova dwelling unit has 46 kWh/day ventilation losses

How much energy could we produce on a 100 m² roof filled with PV panels?

Foodstuff	Energy content (kWh/kg or kWh/l)	Unit	Ventilation losses on yearly basis (120 heating & cooling days)	PV yearly yield on typical roof of 100 m² = 18700 kWh
Chocolate	6.6	**chocolate bars**	9324	**31587**
Chips	6.3	**bags of chips**	5160	**17480**
Snickers	5.6	**Snickers**	19680	**66670**
Pinda	6.9	**bags of pinda**	4560	**15448**
Cola	0.5	**bottles of cola**	10560	**35774**

Problem statement

What is the Bornova environmental performance?

(Carbon Footprint)

BORNOVA (IZMIR) HOUSEHOLD

households 4
avg floor area 100 m²
avg built area 100m²

ENERGY **3.78 tCO₂eq**
electricity demand 5200 kWh/yr
heat demand 7570 kWh/yr
gas for heating (100% of households) 986 m³/yr

CF electricity = 2488 kg CO2eq
CF heating syst. = 1291 kg CO2eq

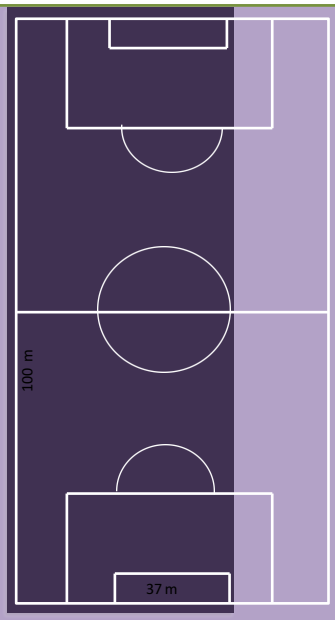
WASTE MANAGEMENT **1.5 tCO₂eq**
waste production 1503kg/yr
waste to landfill 70%
waste to energy 0%
waste to recycling & compost30%

WATER USE **0.06 tCO₂eq**
water use 96 m³/yr
i.e. 65L/dayper capita

CO_2eq CARBON FOOTPRINT **5.04 t CO_2eq/yr**

CARBON FOOTPRINT OFFSET

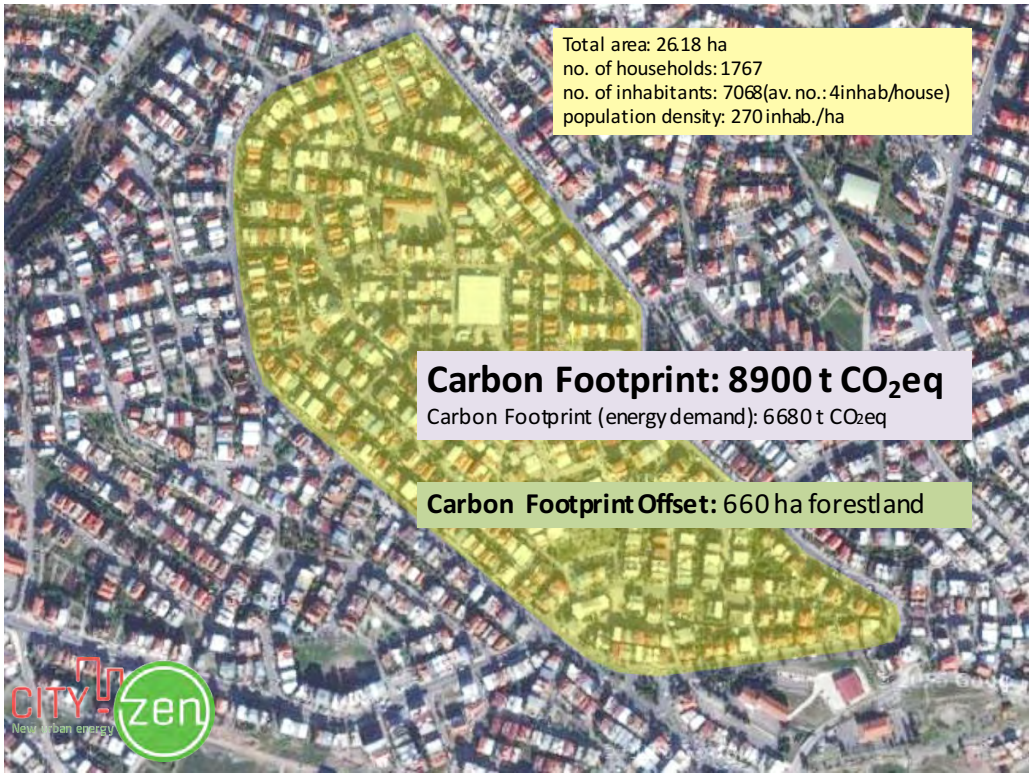
carbon uptake by urban forestry (i.e. 1.35 kg CO_2/m^2)



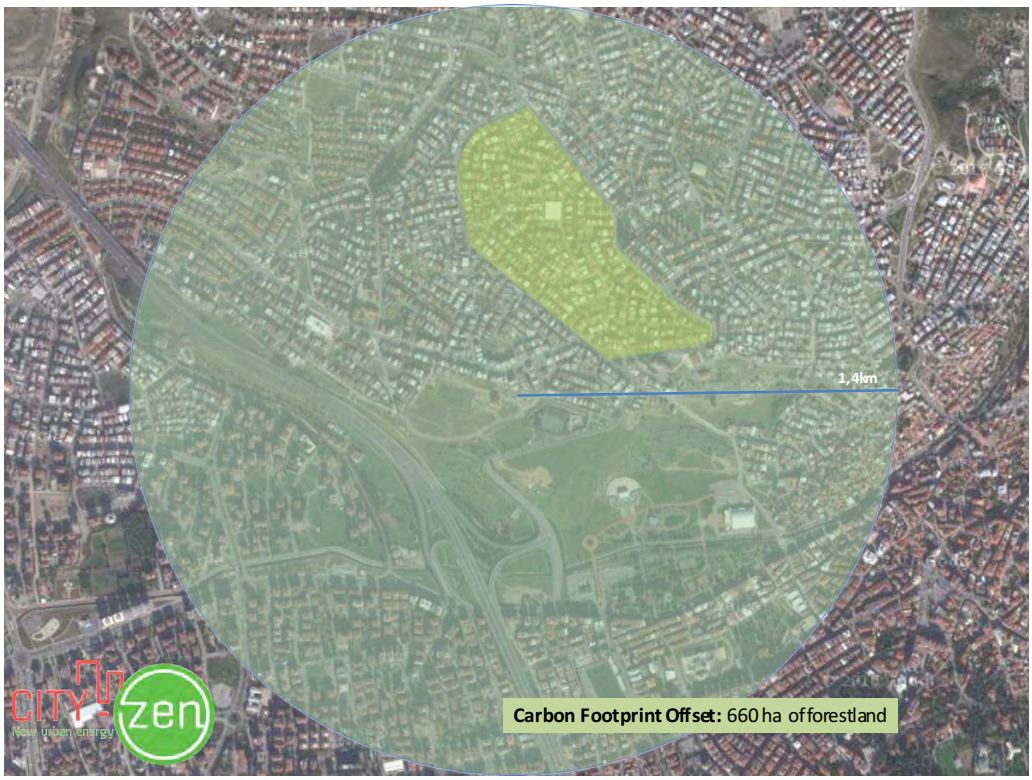
CARBON FOOTPRINT = 5.04 t CO_2eq

CARBON OFFSET = 3737 m^2

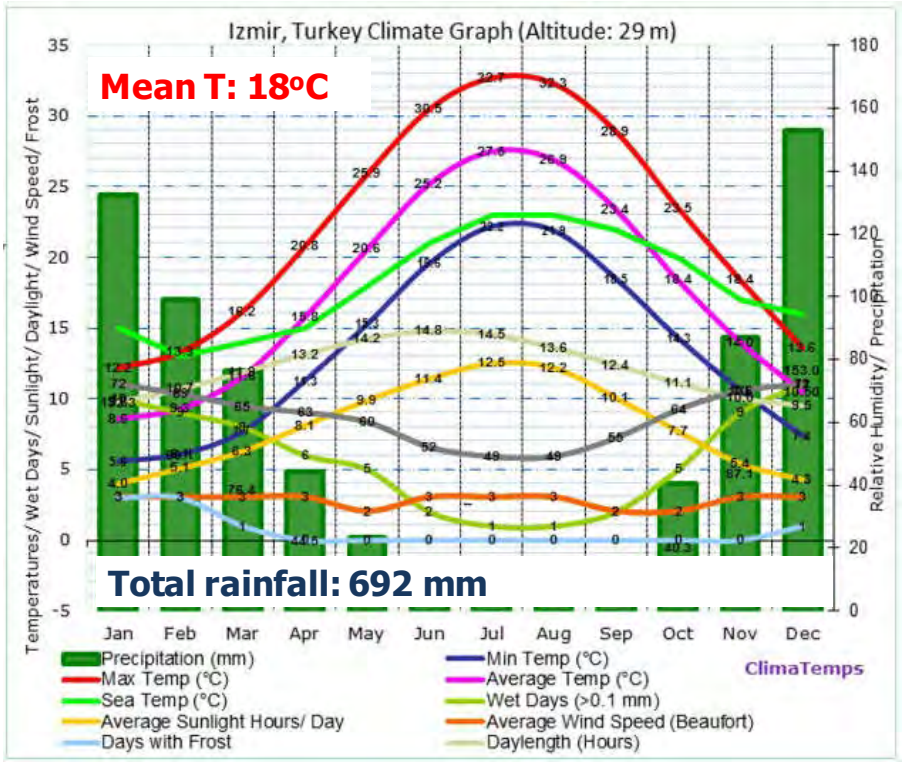

Total area: 26.18 ha
no. of households: 1767
no. of inhabitants: 7068 (av. no.: 4 inhab/house)
population density: 270 inhab./ha


Total area: 26.18 ha
no. of households: 1767
no. of inhabitants: 7068 (av. no.: 4 inhab/house)
population density: 270 inhab./ha
Carbon Footprint: 8900 t CO_2eq
Carbon Footprint (energy demand): 6680 t CO_2eq
Carbon Footprint Offset: 660 ha forestland

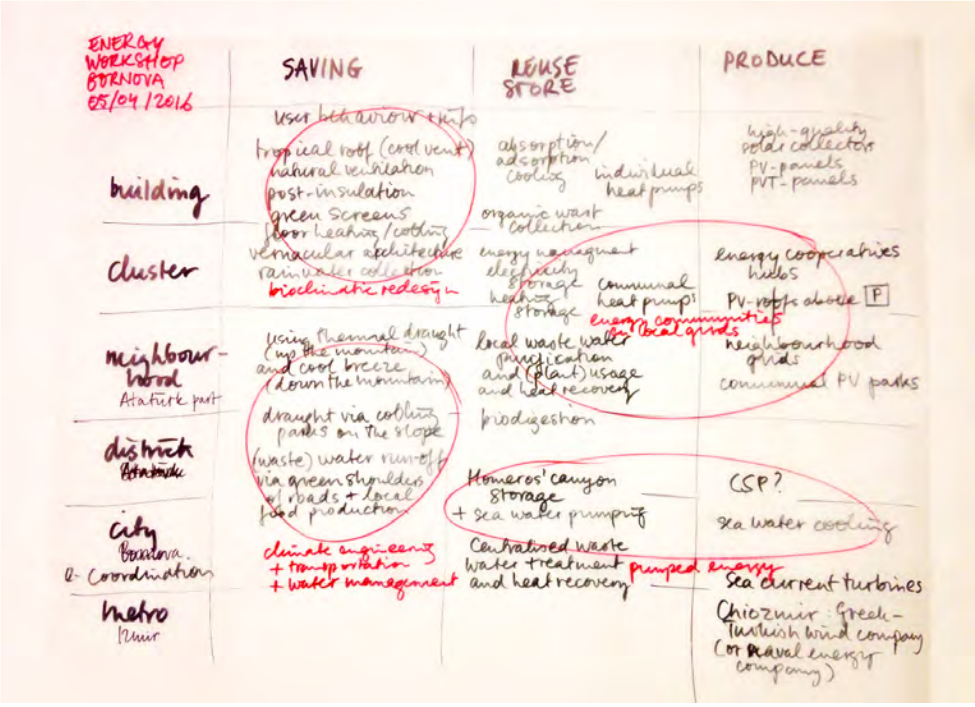

26 ha built area
Carbon Footprint
8900 t CO_2eq
30 ha green area
Carbon Footprint Offset
405 t CO_2eq
= 5% CF


1,4km
CITY zen
Carbon Footprint Offset: 660 ha of forestland

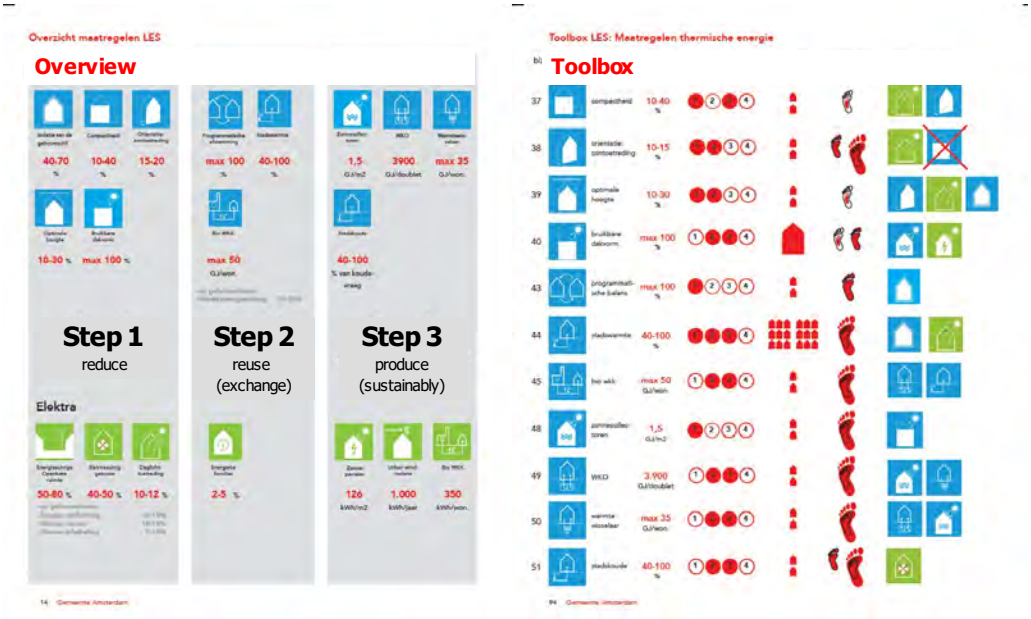

STARTING CONDITIONS



Bornova energy interventions scheme



Final goal: İzmir energy guidelines



BORNOVA ENERGY INTERVENTIONS

Concept:

1. **Different scale levels** of agglomeration, each one accommodating its most suitable technological and process-wise set up.
2. **Passive (energy efficiency) and active (renewable) energy measures** at every scale level, preferably combined with water, materials and community-related issues.
3. **The most appropriate level of application** shall be chosen in consultation with all parties, depending on the opportunities (budget, stakeholders, regulatory issues, ...).

Scenarios for change

What can we do both about energy losses and producing energy on site?

('Bornova energy interventions')

New Stepped Strategy

1. **Reduce (the demand)**
   - User behaviour
   - Bioclimatic design
   - Passive design measures
2. **Reuse (waste energy)**
   - Heat recovery
   - Functional programming
   - Energy exchange
   - Storage
   - Smart energy management
3. **Produce (renewable energy)**
   - Solar energy
   - Soil energy
   - Water
   - Biomass

REDUCE THE DEMAND

- **User behaviour**
  - Information, guidelines
  - Stimulation, correction
- **Bioclimatic design**
  - Temperatures: mean temperature, seasonal differences, diurnal differences
  - Sun: solar course in different seasons, solar intensity, admission or obstruction
  - Air: wind directions, wind forces, thermal draughts, cool breezes
  - Water: rainfall throughout the seasons, evaporation, humidity
  - Earth: soil build-up, constitution, ground water table, aquifers
- **Passive design**
  - Orientation: north-south, east-west
  - Internal zoning: north-south, above-below, depending on the function
  - Compartmentalisation: isolation of rooms with special demands
  - Facades: thermal insulation, permeability, mass, albedo
  - Roofs: pitched/flat, thermal insulation, mass, albedo, tropical roof
  - Shading: overhangs, screens, blinds, green

REUSE RESIDUAL ENERGY

- **Heat recovery**
  - from exhaust air (air → air via heat exchanger; air → water via heat pump)
  - from waste water (water → water, via shower heat exchanger or heat pump)
- **Functional programming**
  - Energy balance between urban functions or functions in a building complex
- **Energy exchange**
  - Inter-exchange of surpluses and shortages between buildings
  - Heat cascading between urban functions
- **Storage**
  - Heat: high-caloric (60+ degrees), low-caloric (25-55 degrees)
  - Cold (5-20 degrees)
  - Electricity: batteries, electric vehicles, water storage
- **Smart energy management**
  - Attuning supply and demand
  - Energy programming and switching, peak-shaving

PRODUCE RENEWABLE ENERGY

- **Solar energy**
  - Photo-voltaics, building-integrated PV, PVT
  - Solar heat: collectors, façade or roof heat collection, road collectors
- **Soil energy**
  - Heat exchange with soil/ground (mean annual temperature)
  - Storage of heat and cold (in aquifers)
  - Geothermal heat (high-caloric)
- **Water**
  - Heat exchange (rivers, lakes, sea)
  - Hydro-electric (storage of excess electric energy)
- **Biomass**
  - Bio-organic waste for bio-fermentation to biogas
  - Waste water to biogas, or via algae to biodiesel

New buildings

- **Construction**
  - Concrete structure
  - Porous bricks
  - Cellular concrete blocks
- **Insulation**
  - Structure covered with 3-4 cm of styrofoam (against thermal bridging)
  - No insulation added to porous bricks or cellular concrete blocks
  - Façade covered with plaster
- **Balconies**
  - A lot of balconies

Future houses

STRATEGY

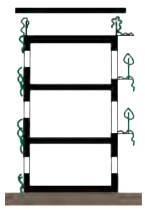
- **Solar, solar, solar**
  - İzmir: one of the best locations for solar energy
  - Energy saving (often difficult) becomes less urgent
  - Solar will make İzmir independent from centralised fossil energy
  - Converted solar energy will decrease urban temperatures
- **Large-scale active solar**
  - Large PV roofs: market square, industrial buildings
  - PV fields on steep slopes of the Atatürk ice-skate park
  - Elevated tropical PV roofs on houses
  - Vertical PV on facades/on glass?
  - Building-integrated solar collectors
- **Heat pump systems**
  - Fed by PV power
  - Air-, water- or (best:) ground-source
  - Coupled to floor heating/cooling (good when there are air leakages)

BORNOVA ENERGY INTERVENTIONS

Level 1: the individual dwelling unit (apartment, house)

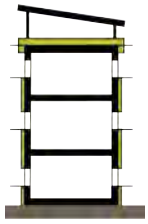
Passive measures:

- Roof and facade shading measures
- Greening (roofs, facades & blind walls, balconies, private outdoor spaces)
- Retrofit insulation: (1) roofs, (2) windows, (3) facades

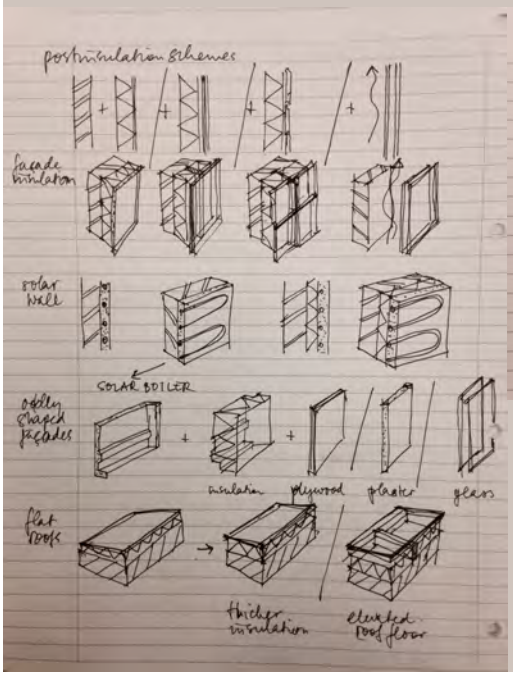


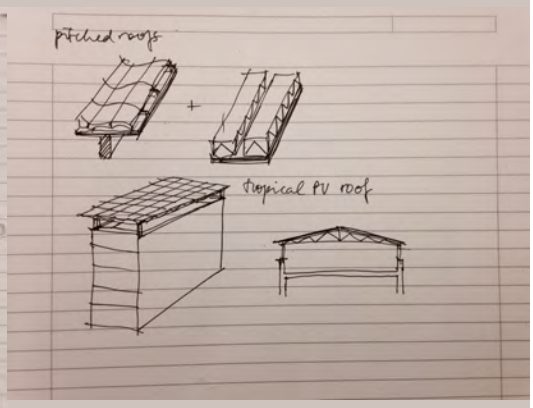
Active measures:

- Produce DHW (domestic hot water) with solar collector + small scale storage
- Individual PV on rooftops

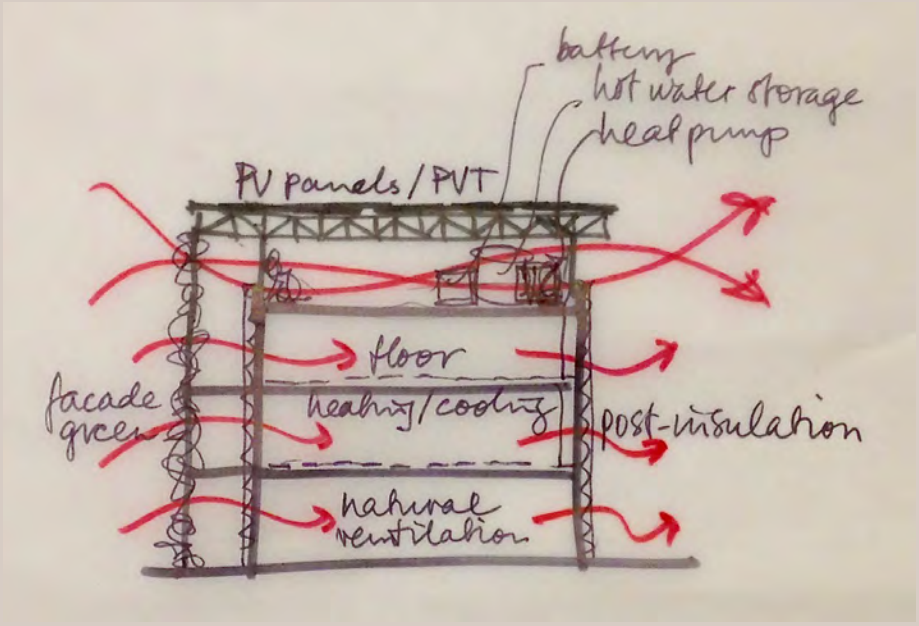


Overview of post-insulation options





Smart & bioclimatic re-design



APARTMENT BLOCK SCALE

BORNOVA ENERGY INTERVENTIONS

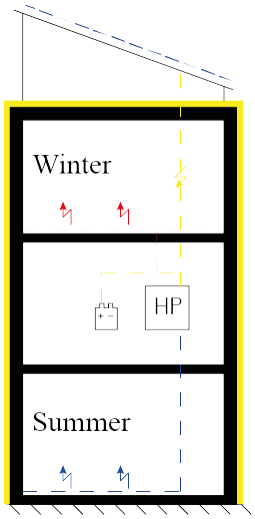
Level 2: the apartment block

Passive measures:

- Roof and facade shading measures
- Greening (roofs, facades & blind walls, balconies, private outdoor spaces)
- Retrofit insulation: (1) roofs, (2) windows, (3) facades

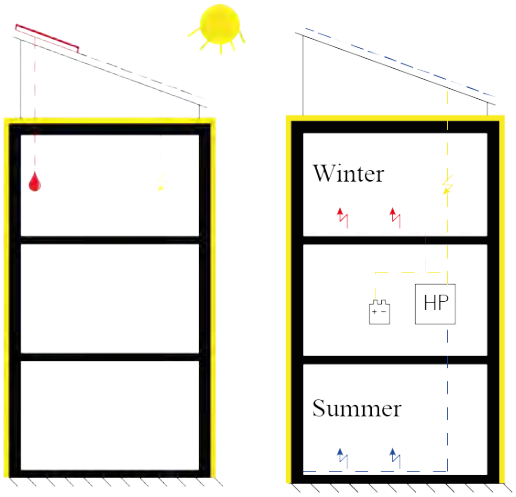
Active measures:

- Air source based heat pumps (+ PV) + retrofit floor cooling and heating for LT heat pump
- Electricity storage in batteries, if feasible

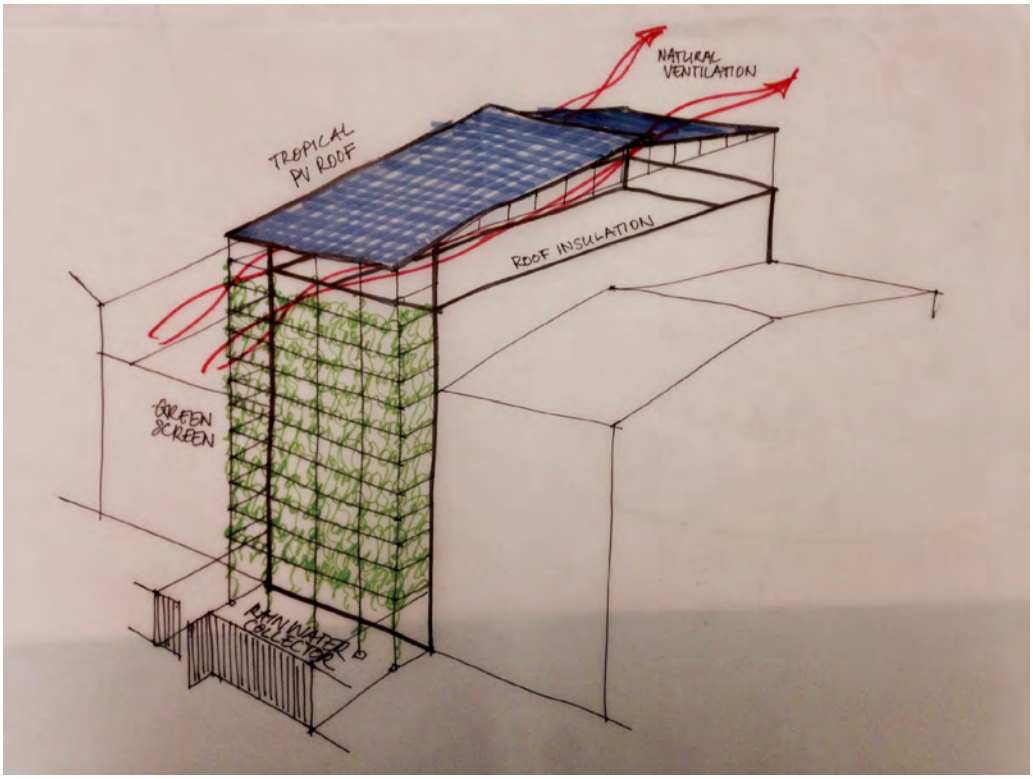


BORNOVA ENERGY INTERVENTIONS

Level 2: the apartment block



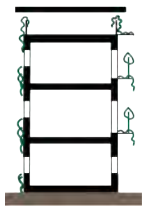
• 33

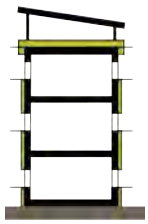


BORNOVA ENERGY INTERVENTIONS

Level 1: the individual dwelling unit (apartment, house)

level 1 Individual appartment energy upgrade Bornova		energy demand (MWh/y)	energy saved (MWh/y)	CO2 emmision (tCO2eq/y)	CarFP %
0 **Appartment**	1				
heat demand	7570 kWh	7570		1294	
electricity demand	5200 kWh	5200		2486	
of which cooling demand	2600 kWh	2600			
Total:		12770		3780	100%
1 **roof and façade shading**					
heat demand	7500 kWh	7570		1294	
electricity demand	5200 kWh	2600		1243	
cooling demand remainder	90%	2340		1119	
Total:		12510		3656	96,7%
2 **greening up**					
heat demand		7570		1294	
electricity demand		2600		1243	
cooling demand	90%	2106		1007	
Total:		12276		3544	93,8%
3 **insulation roof/windows/glazing: reduction**					
heat demand remainder	75%	5678		971	
electricity demand		2600		1243	
cooling demand remainder	95%	2001		956	
Total:		8278		3170	83,9%
4 **Rooftop energy production**					
avg solar insolation	1300 kWh/m2	avg PV system efficiency			15%
projected hor surface area buildings	100 m2	AVG Solar DHW system efficiency			25%
av available part for solar PV production	20%	av available part for solar heat production			5%
available surface per house	20,0 m2				
annual elctricity production on roofs	3900 kWh				
annual DHW production on roofs	1625 kWh				
heat demand		4053		693	
electricity demand incl cooling		701		335	
Total:		4753		1028	27,2%

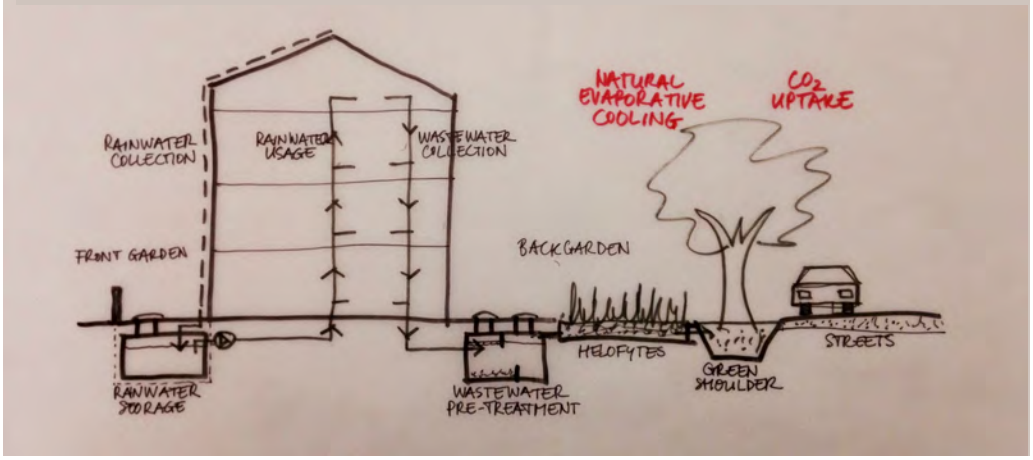




• 35

Sustainable water system

- **Drinkwater consumption (for toilets, washing machine and plants)**
  - ❑ Approximately 200 litre per day per family → 73 m3 per year
- **Rainwater collection**
  - ❑ 100 m2 roof, 700 mm per year → 70 m3 per year; storage of 10-15 m3 needed
- **Wastewater production**
  - ❑ Approximately 500 litre per day per family → 180 m3 per year = 2 big trees



BORNOVA ENERGY INTERVENTIONS

Level 3: the street block

Passive measures:

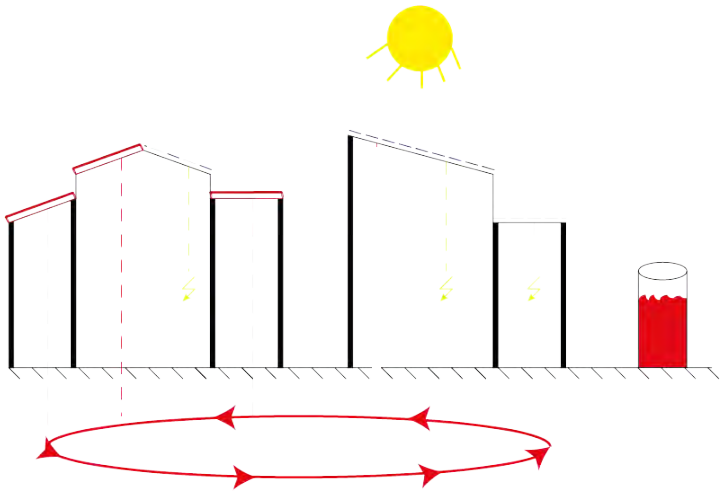
- **Energy cooperative** and support from the municipality (advice to shareholders/participants)
- **Greening and unsealing streets and open spaces** (ground surfaces) promoting rain water penetration and evaporative cooling, diminishing the urban heat island, plus social and psychological advantages

Active measures:

- **Mini district heating & cooling** based on heat pumps
- **Storage** (heat in winter, cold in summer): water, brine, PCMs
- **Solar**: collective PV and/or solar collectors and/or PVT

BORNOVA ENERGY INTERVENTIONS

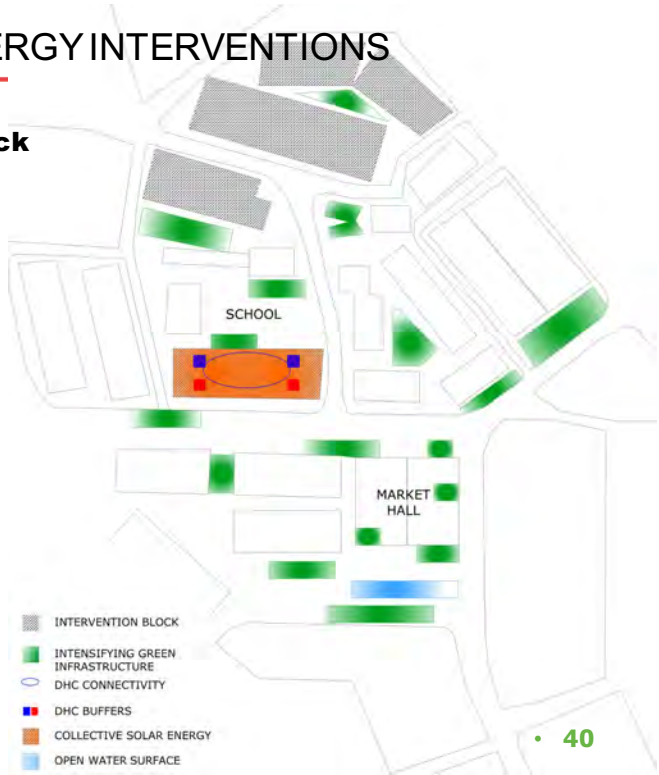
Level 3: the street block



• 39

BORNOVA ENERGY INTERVENTIONS

Level 3: the street block



• 40

BORNOVA ENERGY INTERVENTIONS

Level 3: the street block

level 2 & 3 Street block with small heat-cold network		energy demand	energy saved	CO2 emmision	Car FP
Bornova		(kWh/y)	(kWh/y)	(t CO2eq/y)	%
0 **Street block**					
Appartments	24				
heat demand	4053 kWh	97260		16631	
electricity demand incl cooling	701 kWh	16817		8038	
of which cooling demand	2001 kWh	48017		22952	
Total:		**114077**		**24670**	**27,2%**
1 **air source based heatpump per app. block**					
COP heating season	3				
COP cooling season	4				
heat demand		0		0	
electricity demand		61241		29273	
cooling demand		0		0	
Total:		**61241**		**29273**	**32,3%**
2 **greening and desealing the surface around streetblock**					
remaining cooling demand	95%				
heat demand	0 kWh	0		0	
electricity demand incl cooling	0 kWh	60641		28986	
of which cooling demand	45616 kWh	0			
Total:		**60641**		**28986**	**32,0%**

BORNOVA ENERGY INTERVENTIONS

Level 3: the street block

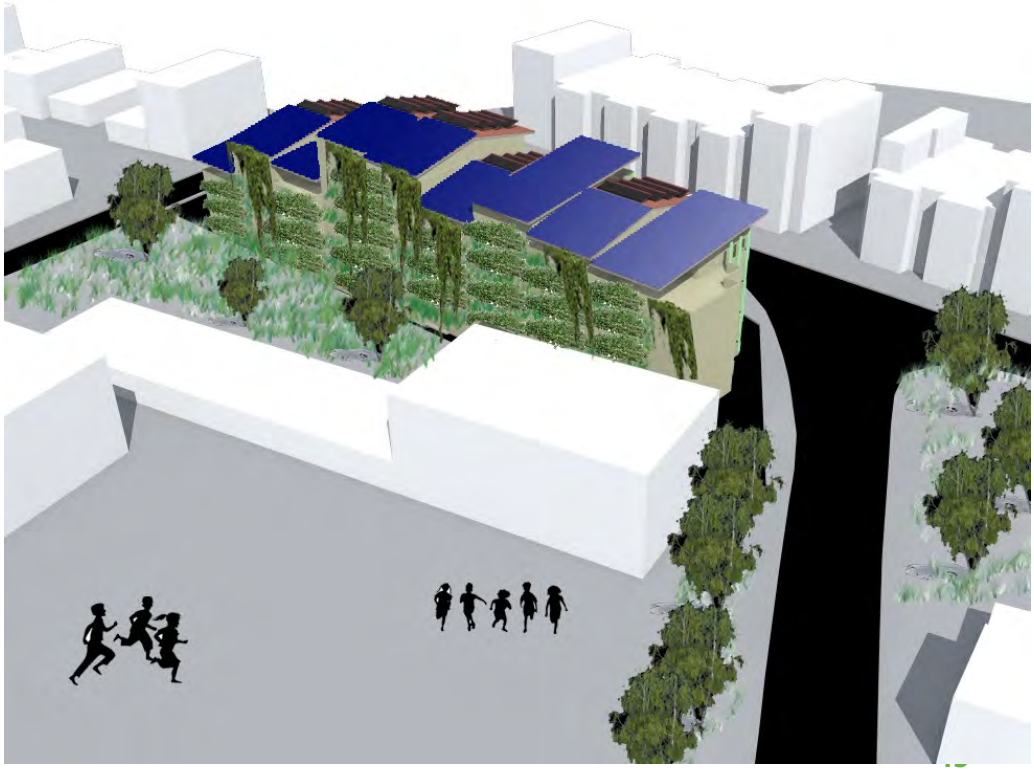
level 3 Street block with small heat-cold network		energy demand	energy saved	CO2 emmision	Car FP
Bornova		(kWh/y)	(kWh/y)	(t CO2eq/y)	%
mini heat-cold grid between blocks					
Appartments	**24**				
buiding blocks	7				
heat demand	136260 kWh			23300	
electricity demand excooling	62400 kWh			29827	
of which cooling demand	45616 kWh			21804	
				53128	**100%**
high performance solar collectors + PV					
avg solar insolation	1300 kWh/m2	avg PV systemefficiency			13%
projected hor surface areabuildings	100 m2	AVG Solar DHW system efficiency			35%
av available part for solar PV production	75%	av available part for solar PV production			25%
available surface per house	100,0 m2				
annual elctricity production on roofs	88725 kWh	COP heating season			3,5
annual heat production on roofs	11375 kWh	COP cooling season			4
heat demand in electricity for HP	16181 kWh				
electricity demand	-26325 kWh				
cooling demand in electricity for HP	11404 kWh				
heat demand		0		0	
electricity demand		1260		602	
cooling demand		0		0	
Total:		**1260**		**602**	**1,13%**

BORNOVA ENERGY INTERVENTIONS

• 43

BORNOVA ENERGY INTERVENTIONS

• 44



BORNOVA ENERGY INTERVENTIONS

Level 4: the mini-neighbourhood (a small group of street blocks)

Passive measures:

- **Greening and unsealing streets and open spaces** (ground surfaces) promoting rain water penetration and evaporative cooling, diminishing the urban heat island, plus social and psychological advantages
- **Planting trees** and creating green (hanging) street covers / green community terraces and squares / ...
- Streets as solar ventilation shafts
- **Rain water capture and storage**

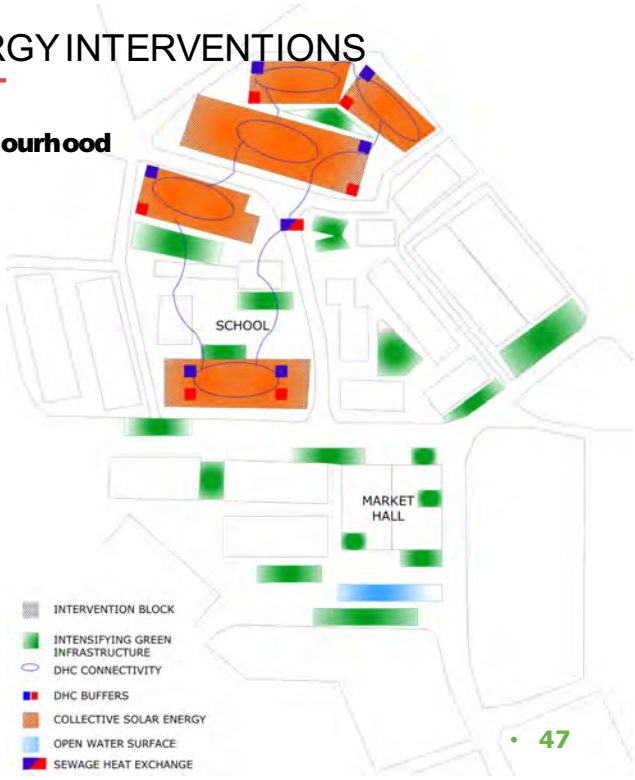
Active measures:

- Connect street blocks to mini DHC grid (winter heating, summer cooling)
- Sewage water heat exchange with heat pump systems

• 46

BORNOVA ENERGY INTERVENTIONS

Level 4: the mini-neighbourhood



• 47

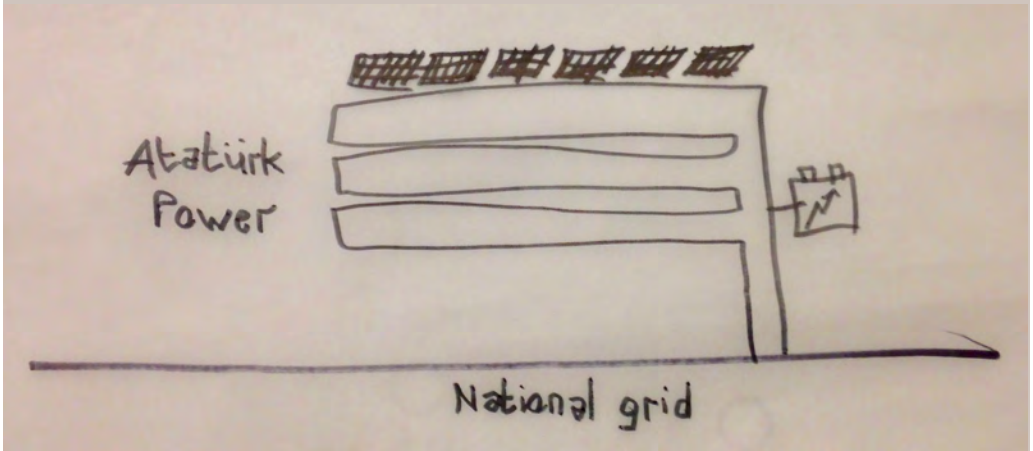
BORNOVA ENERGY INTERVENTIONS

level 4 Street block small heat-cold networks connected			energy demand	energy saved	CO2 emmision	Car FP
Bornova			(kWh/y)	(kWh/y)	(t CO2eq/y)	%
mini neighbourhood original demand						
Appartments	100					
buiding blocks	7					
heat demand	567750	kWh			97085	
electricity demand excooling	260000	kWh			124280	
of which cooling demand	190067	kWh			90852	
					221365	**100%**
high performance solar collectors + PV						
avg solar insolation	1300	kWh/m2				
projected hor surface areabuildings	100	m2				
av available part for solar PV production	**90%**					
available surface per house	100,0	m2				
annual elctricity production on roofs	380250	kWh				
annual heat production on roofs	113750	kWh				
heat demand in electricity for HP	28188	kWh				
electricity demand	-120250	kWh				
cooling demand in electricity for HP	42237	kWh				
heat demand			0		0	
electricity demand			-49826		-23817	
cooling demand			0		0	
Total:			**-49826**		**-23817**	**-10,76%**

avg PV systemefficiency	13%
AVG Solar DHW system efficiency	35%
av available part for solar heatproduction	**10%**
sewage water heat exchanger:	
COP heating season	4
COP cooling season	4,5

• 48

Ataturk energy community



BORNOVA ENERGY INTERVENTIONS

Level 5: the neighbourhood

Passive measures:

- **Connecting green patches** – green/blue network including storm water drainage in wadi/vadi concept, integrating parks and other infrastructure.
- **Open water streams** combined with local water purification scenarios.
- **Neighbourhood rain water storage spaces** – half underground or accommodating greenery, community uses, etc.
- **Community centre**, demonstration building and information point – 'one stop shop' concept for citizens, cooperations etc. seeking advice on energy, retrofitting, and related matters.

• 51

BORNOVA ENERGY INTERVENTIONS

Level 5: the neighbourhood

Active measures:

- **Parking facilities with PV roof** (tropical roof concept, shading, electric charging, other PV applications)
- **Roofs for collective energy production** (PV, PVT, solar collectors) with commercial and office buildings
- **V2G (vehicle to grid):** from cars to include electric bikes and motorcycles. See plan Craig & Greg.
- **Smart grids** / active demand control
- **Adsorption** cooling with high performance/high-T solar collectors

• 52

BORNOVA ENERGY INTERVENTIONS

Level 5: the neighbourhood

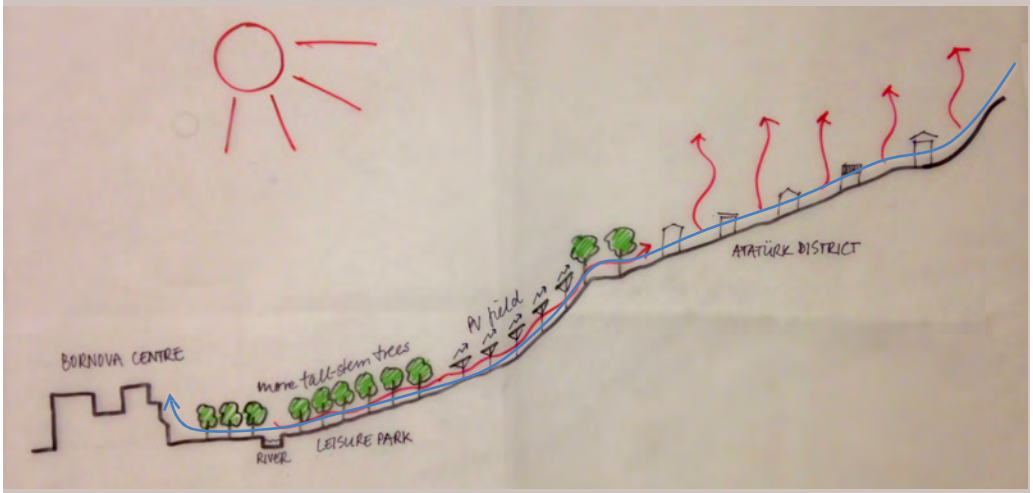
BORNOVA ENERGY INTERVENTIONS

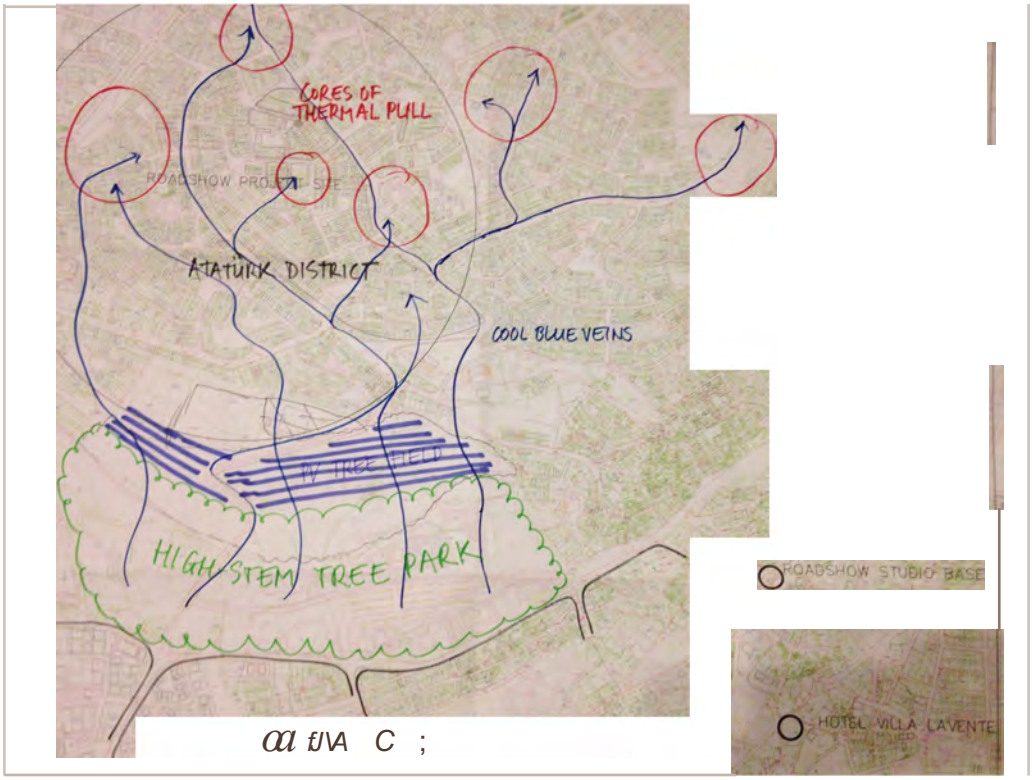
Level 5: the neighbourhood

level 5 Street block small heat-cold networks connected + marketplace		energy demand	energy saved	CO2 emmision	Car FP
Bornova		(kWh/y)	(kWh/y)	t CO2eq/y)	%
PV production Market roofrop					
avg solar insolation	1300 kWh/m2	avg PV systemefficiency			15%
rooftop area	3000 m2	av available part for solar PV production			90%
annual elctricity production on marketroof		526500 kWh			
overproduction electricity		576326		-27548(	-124,45%

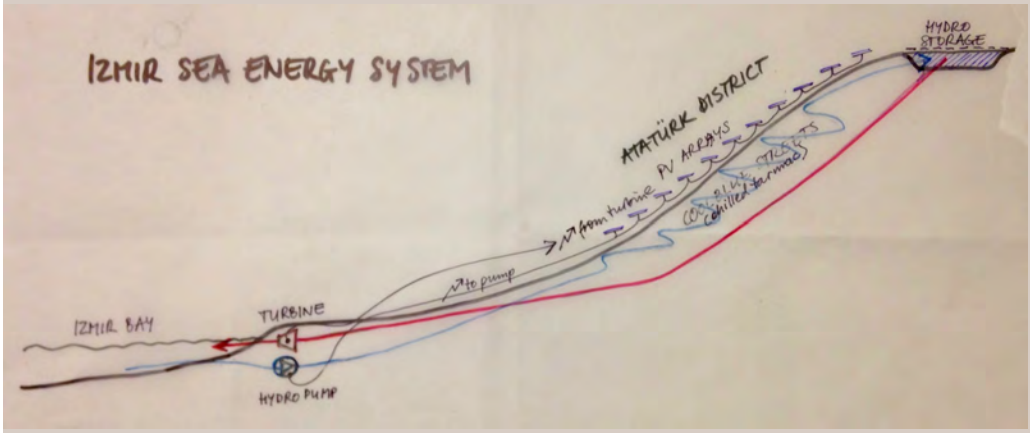
IDEAS FOR THE DISTRICT TO CITY SCALE

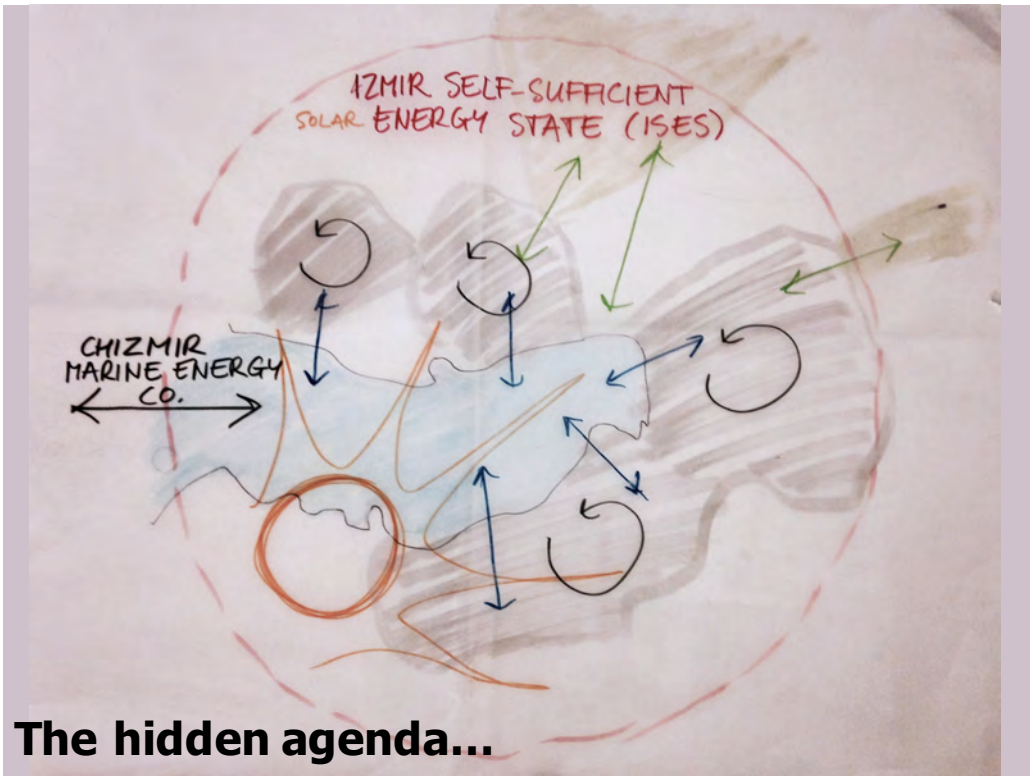
Create cool flows by thermal day draught
(and cool breezes from the hill at night)





Pavement cooling and hydro-power





The hidden agenda…

Bornova

Thank you!