

Could urbanization kill us?

Ben-Gurion University’s Prof. Isaac Meir says sustainable urban design and building practices are essential for a healthy future

• By JERUSALEM POST STAFF

“Developing appropriate paradigms and technologies for sustainable urbanization and further development and construction is becoming a matter of survivability,” according to Prof. Isaac Meir of the Department of Civil and Environmental Engineering at Ben-Gurion University of the Negev’s (BGU) Faculty of Engineering Sciences.

Meir is also a member of the Desert Architecture and Urban Planning Unit at BGU’s Jacob Blaustein Institutes for Desert Research and a researcher in BGU’s new School for Sustainability and Climate Change.

Meir, who has been studying urbanization and the impact of construction on the environment and vice versa for decades, told The Jerusalem Post that without novel approaches to urban design and building and integrated technologies “it is probable that significant parts of what is today’s settled land may have to be abandoned” – and it could ultimately have a cost in human lives.



One of Prof. Meir’s projects from long ago was to design the administration building at the Sde Boker campus and outfit it with passive cooling and solar panels (shown here). *Photo by Dani Machlis/BGU*



The issue is becoming more urgent when viewed from the perspective of developing countries that are growing in terms of population and also aiming to achieve a standard of living more similar to that of developed countries. To get there, these countries are more often than not using unsustainable materials, processes and technologies, Meir said.

“A recently published longitudinal study of green building standards in the Middle East and North Africa showed that not only is the population growth significantly higher than in other parts of the world but that an ever-increasing percentage of this population is moving toward the cities, where existing buildings are insufficient and the current and

future construction are not necessarily guided by green building standards and technologies, and eventually the urban climate will be exacerbated both by currently ongoing climatic changes and unsustainable urban growth and construction,” Meir wrote in a recent paper.

But even in developed countries, climate change coupled with population growth and urban sprawl, are raising red flags for people like Meir, who want to preserve a healthy environment for future generations.

Meir said there are many aspects to consider when building modern cities. For starters, it is important to understand how to orient new buildings. In Israel, for example, the summer sun rises in the northeast and by noon its altitude is almost vertical. Sunset is in the northwest.

“All the buildings whose windows are facing the Mediterranean Sea cost an arm and a leg to acclimatize and they are energy disasters,” Meir said, noting that south-facing windows are easier to deal with in the

summer and allow for extra heat in the winter, which saves a lot of energy.

“The orientation [of a building] is something that needs to be taken into consideration the moment we put pencil to paper and start designing,” Meir said.

Another aspect is building height and materials. It’s trendy now to put up high-rise buildings covered with fully glazed glass facades. But according to Meir, “it is mad to put such buildings in the Middle East.”

Meir and his team recently conducted a study in Tel Aviv looking at how designing a climatically responsive building envelope (walls, roof, windows) that interacts appropriately with the ambient climate conditions, could take advantage of passive heating and cooling and reduce operational energy.

They found that 50% less energy was spent when constructing a building with a double-skin facade, meaning one consisting of two layers – usually glass – where air flows through the intermediate cavity. Further adjusting the double-skin facade design

to fit specific climate conditions reduced energy loads even more.

Moreover, they showed that winter cooling loads alone dropped by 50% when a dynamic double-skin facade envelope that alternates between airtight and open-air according to temperatures that are created within the cavity is implemented.

The findings “point out the importance of carefully detailing the building envelope during the initial design stages in order to improve the energy efficiency of the structure, based on the specific climate conditions of its location,” Meir and colleagues wrote in the paper.

In separate studies, Meir has raised the challenge of “heat traps” that can result as cities become bigger and denser, buildings taller and streets deeper and narrower.

“When we talk about sustainability in urban environments, there is a huge world of considerations, practices and principles,” Meir told the Post. “Sustainability goes all the way from the concept of

how to design the building, which direction it faces and how it uses the topography. Sustainable architecture is becoming more common knowledge in that people are talking about it, but the details are not yet clear to most, including to many of the architects.”

He noted that COVID-19 raised the need to reassess the use of open spaces and enhance ventilation as families were forced into lockdown, and as packed classrooms became breeding grounds for COVID germs.

In Israel, specifically, he said the situation is even more urgent than in other parts of the world, given the tens of thousands of apartments that have to be provided as the population grows and more immigrants move to the country.

“We need standardization, planning and construction rules and laws that will enforce the way things must be done,” Meir said. “We need quite a lot of education.

“If buildings don’t adapt themselves to climate change, it will cost human lives.”



PROF. ISAAC MEIR (right) is figuring out how to build office buildings that will survive extreme weather and rising temperatures. *Photo by Dani Machlis/BGU*



The Marcus Family Campus of Ben-Gurion University of the Negev in Beer-Sheva. *Photo by Dani Machlis/BGU*

Why Israelis don't necessarily save energy when buying greener cars

• By JERUSALEM POST STAFF

When consumers buy energy-efficient cars, they tend to drive more, according to a top research team at Ben-Gurion University of the Negev (BGU).

A team of researchers from the school have shown in their recent research that some government incentives meant to promote energy savings may actually increase the “rebound-effect” in years following their implementation - so that not only do the incentives not achieve maximum effectiveness, in some cases the benefits can be lost.

“Consumers have their own needs and wants,” explained Dr. Stav Rosenzweig of BGU’s Department of Management in the Guilford Glazer Faculty of Business and Management, “When we are faced with a regulation, we might not do what the policy maker intended us to do.”

Rosenzweig is also a researcher in BGU’s new School for Sustainability and Climate Change.

The rebound effect is defined as “the difference between the expected and the actual environmental savings from efficiency improvements once a number of economic mechanisms have been considered, that is, the savings that are taken back,” according to the website Science Direct. Rosenzweig said that international economic literature estimates that 20% to 40% of the potential fuel savings associated with cars’ improved energy-efficiency are lost to increased driving.

To determine whether the rebound is constant over time, Rosenzweig, Dr. Ofir Rubin and doctoral candidate Aviv Steren of the Guilford Glazer Faculty of Business and Management and the School of Sustainability and Climate Change, have examined in various studies the presence, or lack thereof, of a long-term rebound in Israel after it implemented certain incentives in 2009 to encourage citizens to buy energy efficient cars. They specifically looked at whether consumers increased or decreased their car usage in the long-term, thereby contributing to a larger or smaller rebound.

“Our findings indicate a rebound-effect of 62% a year after the introduction of the policy,” Rosenzweig and her team explained. “Whereas it remains relatively steady in subsequent periods, it later gradually intensifies until it reaches more than 100%. This



DR. STAV ROSENZWEIG, pictured here on the bridge leading to the University's hi-tech park, discovered that Israelis buying hybrid cars does not solve the pollution problem because they drive more. *Photo by Dani Machlis/BGU*

unique finding suggests that virtually all the potential energy savings due to energy-efficiency improvements were lost to increased driving.”

Rosenzweig and her team believe that the reason for this is that consumers become increasingly aware of usage costs over time and “this increased awareness may encourage energy-efficient car owners to drive more, thereby saving considerably less energy.”

“Let’s say you usually commute to work, that’s it,” she continued. “If the government incentivizes you to buy an energy efficient car, then it costs less to commute.”

Instead of NIS 5, for example, it only costs 2.5 to commute each day. The consumer realizes that he or she saved money and believes that since the car he or she is driving is energy efficient, it’s also not that bad for the environment.

“The person might decide to travel more by car, or even move to the suburbs so that she now has a longer commute,” Rosenzweig suggested.

The rebound effect is not limited to driving. It has been seen in other research of energy efficient products, such as light bulbs or even refrigerators. People who buy energy-efficient light bulbs keep the lights on longer, she said. Some people buy bigger refrigerators just because the fridge is now cheaper to maintain.

“There is a psychological phenomenon going on here,” she said. “I feel I have saved money and I also feel I did something positive for the world, so I license myself to do something that is not as good in other areas that I would never consider doing otherwise.”

Would the world still be in a better position if everyone bought energy efficient cars?

Rosenzweig has a solution: She and her team advocate for using subsidization of energy-efficient cars and taxing by kilometers traveled as complementary components in a policy aimed at decreasing energy consumption. She said the distance traveled tax would offset the tendency for individuals who drive energy-efficient cars to increase the number of kilometers they drive. Such a solution, however, should be adjusted for residents in the periphery with no proper access to public transportation.

What’s next for her?

Israel has made a decision that beginning in 2030, only non-fossil fuels vehicles will be permitted to be imported into the country. Now, she and her team are looking at what incentives the government might need to offer to get citizens to expedite the switch to electric cars so that by then car manufacturers will not flood the Israel car market with polluting vehicles.

Can we eat healthy and protect the environment at the same time?

New BGU research shows the Mediterranean diet is good for your health and your surroundings

• By JERUSALEM POST STAFF

After years of examining the health and environmental impact of food and diets separately, at least one Israeli researcher has acknowledged the need to integrate them.

Meet Prof. Danit Shahar of Ben-Gurion University’s School of Public Health - also a researcher in BGU’s new School for Sustainability and Climate Change.

“A sustainable food system ensures food security and nutrition for all while considering present and future economic, social, and environmental implications,” Shahar wrote in a recent paper that she shared with The Jerusalem Post.

She noted that according to the United Nations Food and Agriculture Organization, “providing a growing global population with healthy and sustainable diets is an immediate challenge.”

She said that for years scientists looked at food to understand how it affected people’s health. But nutrition is also connected to the source from which the food is derived: How much water does it take to grow it? How much land is needed? How much energy? What happens from the time the food is harvested until it reaches the table?

Shahar recently completed an analysis of the dietary habits of 525 Israeli Arab and Jewish Israeli men and women between the ages of 20 and 66. The paper was submitted for publication in a prestigious nutrition journal.



PROF. DANIT SHAHAR
Photo by Dani Machlis/BGU

The typical Israeli diet is based on the Mediterranean dietary pattern, with some variations, such as a higher consumption level of dairy products than in some other Mediterranean countries.

A Mediterranean diet, Shahar explained, is characterized by a high intake of vegetarian ingredients and moderate to low consumption of poultry and meat, as well as high intake of monounsaturated fatty acid - mainly from olive oil, fruits and vegetables and fish. It also includes a moderate amount of wine.

This diet, she said, is known around the world as a diet that helps prevent many serious chronic diseases such as cardiovascular disease and diabetes.

She and her team, which included Prof. Meidad Kissinger from BGU and Dr. Sigal Tepper from Tel-Hai College, found in their analyses that animal protein is the “highest contributor to greenhouse gas emissions and land use,” Shahar said. “Fruits and vegetables contribute the most to water consumption. Nevertheless, most of them are grown using various water sources,

including, potentially, treated wastewater, which reduces environmental pressure.”

Dairy’s contribution to the carbon footprint was found to be more significant than meat consumption. Also, fruits and vegetables had a more significant water footprint compared to grain products in the Israeli diet.

In general, the Mediterranean diet was associated with the lowest greenhouse

gas emissions, land use, and higher water use.

To improve the situation, Shahar and her team have several ideas, such as further developing water management techniques, including advanced technologies, reducing water losses, and improving data quality and monitoring for water-food system linkages, their paper said.

She also noted that certain types of crops that require less water but still have health benefits should be considered, while the consumption of legumes and nuts should be encouraged.

“It seems that there is no conflict between a healthy and sustainable diet but there is a need to

adjust and optimize dietary patterns in light of recommendations for various populations with different dietary needs,” the paper said.

What’s next?

Shahar said she and her team hope to work with other BGU departments to find an algorithm to help explain what people should eat to maximize health benefits and minimize environmental impact.

Fish could feed the world. These BGU researchers know how

• By JERUSALEM POST STAFF

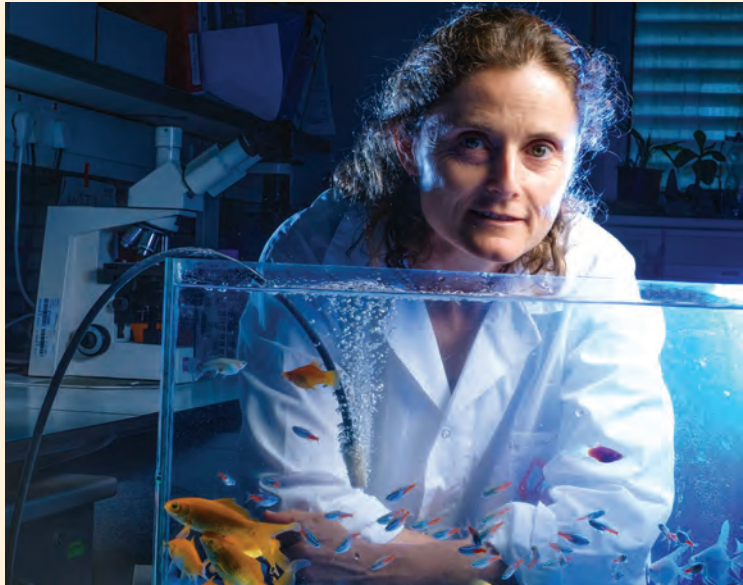
The world is moving away from meat. But people still need quality animal protein to stay healthy and strong. One solution is fish. However, the fish in our seas are being depleted. The future, therefore, is aquaculture – fish grown in ponds.

How can we keep fish healthy, farm them in the most efficient way and reduce the environmental impact of raising fish?

Researchers in Ben-Gurion University’s new School for Sustainability and Climate Change are helping to find solutions.

Dina Zilberg, an associate professor in the French Associates Institute for Agriculture and Biotechnology of Drylands at the Jacob Blaustein Institutes for Desert Research, told The Jerusalem Post that fish consumption around the world is already on the rise.

“Fish is a sustainable source of protein compared to beef,” Zilberg said.



DR. DINA ZILBERG
Photo by Dani Machlis/BGU

She explained that fish are “efficient” animals in that they live in the water and therefore use less energy. Moreover, the amount of food they require to produce edible meat is low compared to land animals: One kilo of feed will produce about one kilo of fish. However, Zilberg said that the world cannot rely on oceans and other natural bodies of water to

provide the quantity of fish that is needed. Instead, “we have to start raising fish.”

Aquaculture is raising fish in man-made ponds. It is the fastest growing sector of the agriculture industry, she said.

According to a report by the World Bank and the Food and Agriculture Organization of the United Nations, by 2030, it is estimated that more than 60% of fish for food will come

from aquaculture rather than wild catches.

But this field is not without challenges, according to Prof. Itzhak Mizrahi of BGU’s Faculty of Life Sciences and the National Institute for Biotechnology in the Negev. And this is where scientists come in.

“We hope to increase our ability to support food security with fish and decrease the

environmental impact of raising them – mainly aiming at increasing feed efficiency – the efficiency at which fish digest their food and the survival rates in aquaculture ponds,” he said.

Another concept is infusing the fish’s commercial feed with microalgae to keep the fish healthy.

A study that Zilberg’s team recently completed showed that doing so elevated the



PROF. ITZHAK MIZRAHI
Photo by Dani Machlis/BGU

expression of genes related to inflammatory and immune responses in fish, demonstrating the potential of microalgae and their active ingredients (like arachidonic acid and dihomo-γ-linolenic acid) in improving immune competence and resistance to bacterial infection.

Another project is examining if fish can be raised in treated wastewater – and Zilberg said

they found that this is feasible.

Finally, they are doing work on how best to grow fish in “harsh environments,” Mizrahi said – something which could become increasingly relevant with global warming. As water temperatures increase, some fish species could struggle to survive.

Mizrahi, who studies microbiomes, discovered that the functionality of fish’s core microbiomes has a strong impact on how they survive and operate.

“Fish have microbial communities in their guts, called gut microbiomes, which our findings suggest affect the fish’s ability to cope with a changing environment,” he said. In a recent effort, his team found a selection of microbes that support the well-being of fish and their ability to survive in harsh environments.

About 690 million people globally are undernourished, according to the United Nations. An aquaculture system, said Mizrahi, could make a solid source of protein and other nutrients better available to the masses.