Geography starter for 12

Welcome to the start of your A-Level in Geography. There are so many factors that will lead you to being a success, the most important one is that you read.

As your Geography teachers we need you to get in the habit of reading as many varied articles as possible.

Attached are 3 articles that we find fascinating and have so much to do with your studies next year.

Read them and complete the task

1- The World's most improbable Green City

Write an essay discussing what Dubai was like before it tired to be energy efficient, what it is trying to do to become more sustainable (examples of initiatives), and your thoughts on if you think it will be a success.

2- City living comes with big benefits, and big disadvantages around the world

Write an essay on the benefits and disadvantages of city living. You must include real life examples.

3- Battling locust swarms in East Africa by Jacob Dykes, Geographical magazine.

Answer the questions below.

1. What is a locust?
2. What does the World Bank estimate the cost to food security and livelihoods to be?
3. Which regions of Africa are affected by the locust swarms?
4. How have global organisations and local farmers tried to stop the locust swarms?
5. What are the social, economic and environmental impacts of the locust swarms?

Social	Economic	Environmental

6. How might the locust swarms lead to soil erosion and desertification?

Finally, this website has lots of fantastic TED talks for geography lovers.
https://geographical.co.uk/reviews/films/item/2977-ted-talks

Battling locust swarms in East Africa

- Written by Jacob Dykes
- Published in **Development**

FAO – Sven Torfen

Control and relief action in Eastern Africa and the Greater Horn of Africa steps up to face the double threat of desert locusts and the Covid-19 pandemic

While the throng of road and air traffic has been muted by the pandemic, the drum of locust wings continues to beat in East Africa and the Greater Horn of Africa. The upsurge in swarms is the worst in decades, with the World Bank estimating that potential damages to food security and livelihoods could reach US$8.5 billion in 2020.

Early signs of the upsurge rippled in 2018; in December, the UN Food and Agriculture Organisation (FAO) issued the first warnings of an outbreak along the Red Sea coast in Eritrea and Sudan. July 2019 saw further warnings that locust summer breeding posed serious threats to agricultural production in Yemen, Eritrea, Sudan, Ethiopia and northern Somalia, and that swarms could invade Kenya by the end of 2019. The situation deteriorated in January 2020, after flooding caused by Cyclone Pawan created favourable breeding conditions. So far two waves of swarms have hit the region threatening the food supply of 23 million people. A swarm of just more than a third of a square mile can eat the same amount of food in one day as 35,000 people.

‘Desert locusts transition between life cycle phases,’ explains Cyril Piou, locust specialist at the Centre for Biology and Management of Populations, Montpellier. ‘During dry phases, reduced vegetation brings groups of locusts together. When heavy rains come, locusts group and reproduce rapidly through generations, shifting from a solitary lifestyle to the “gregarious” phase, which is when mass locust migrations occur.’

The FAO launched a funding appeal in January 2020, requesting $153 million dollars to fund rapid swarm response and anticipatory action in ten countries: Djibouti, Eritrea, Ethiopia, Kenya, Somalia, Sudan, South Sudan, Tanzania, Uganda and Yemen. To date the appeal has netted $130 million (85 per cent of its target), of which 63 per cent had already been spent on control and surveillance operations by the

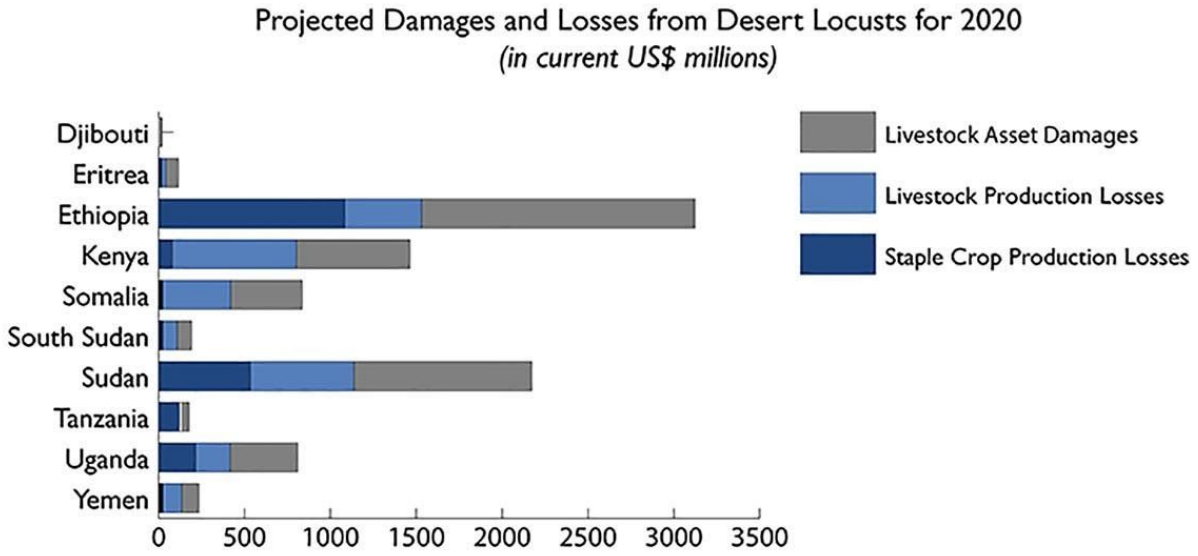
end of April. Funding is also coming from other sources. On 21 May, the World Bank Group approved a $500 million programme to assist poor and vulnerable farmers, herders and rural households.

A worker tackles a swarm [Image: FAO – Isak Amin]

This action has had an impact. In May, the FAO reported that between January and April 2020, 720,000 tonnes of cereal had been saved across 365,000 hectares in the region as a result of controlled pesticide use and surveillance operations – enough to feed five million people for one year. An additional 350,000 pastoral households have reportedly been spared the loss of their livelihoods.

While the news offers a positive lining, some researchers think it's too little, too late. 'What we're seeing now is the result of locust multiplication that wasn't adequately controlled when the locusts were multiplying. Although the FAO are doing what they can, our research suggests that preventative management of locusts, before the gregarious stage, would require only one per cent of what's currently being spent,' says Piou.

In a press release, World Bank Group President David Malpass highlighted the double-threat currently facing the region: 'Locust swarms present a double crisis for countries that are also battling the Covid-19 pandemic.' Lockdowns and travel restrictions have prevented the delivery of locust control equipment, and restricted access for response teams to those that need advice and expertise.



Data from World Bank

In many agricultural communities however it is the locusts, not the pandemic, that worries people most. Ugandan farmer Yoweri Aboket told *ABC News*: 'It's the locusts that everyone is talking about. Some people will even tell you that the locusts are more destructive than the coronavirus. There are even some who don't believe that the virus will reach here.'

Most organisations accept that there will be more swarms. Another locust wave will transition to the young adult phase in late June and early July, coinciding with the harvest. The FAO estimate that favourable breeding conditions could allow for a 400-fold increase in the locust population by June. 'Our gains have been significant; but the battle is long and is not yet over,' said FAO agency chief Qu Dongyu in a press release.

'It's fantastic that there's a huge amount of financial support, but it's not going to stop the crisis in the next few months. The desert locust upsurge will be raging for another year at least,' says Piou.

This was published in the July 2020 issue of Geographical

NATIONAL GEOGRAPHIC

https://www.nationalgeographic.com/magazine/2019/04/city-living-benefits-and-disadvantages-different-around-the-world.html

MAGAZINE THE CITIES ISSUE

How the pros and cons of city living vary around the world

Every day, more people become city dwellers. The challenge of urban existence is to balance its benefits and its drawbacks.

BY JARED DIAMOND

This story appears in the April 2019 issue of *National Geographic* magazine.

For most of the six million years of human evolution, all humans and protohumans lived like somewhat glorified chimpanzees, at low population densities, scattered over the landscape as families or small bands. Only within the past 6,000 years, a small fraction of human history, did some of our ancestors come together in cities. But today more than half the world's people live in these new settings, some of which have tens of millions of inhabitants.

Urban life involves trade-offs. We may gain big benefits in return for suffering big disadvantages. Let's consider two of them: the trade-off between individual freedom and community interests, and the trade-off between social ties and anonymity.

To understand the issue of freedom, take first the city of Singapore, in effect one of the world's most densely populated micro-countries. Singapore's nearly six million people are packed into about 250 square miles—230 times the average U.S. population density. It's an Asian financial center, a major port on one of the world's busiest shipping straits, and a tiny piece of prime real estate wedged between two giant, powerful neighbors, Indonesia and Malaysia. Singapore was part of Malaysia until 1965, when economic and racial tensions spurred its separation. But Singapore depends on Malaysia for most of its water and much of its food, and can't afford to make mistakes or provoke its neighbors.

So Singapore's government monitors its citizens closely, to make sure that individuals don't harm the community. Inspectors check for water standing in each household's pots, lest they furnish breeding sites for disease-transmitting mosquitoes. Smart-technology sensors measure (or will measure) the traffic on every street, the movements of every car, and the temperatures of and shadows cast by buildings. They also will track the water and electricity consumption of every household and will note the time whenever a household toilet is flushed. Americans may view such measures with horror, as George Orwell's novel *1984* come true. But for Singapore's citizens, it's the bargain that they have made with their government: less individual freedom in return for First World living standards, health, and security.

Next consider Germany's cities, also densely populated. Local governments have rules about the shapes and colors of tiles that Germans may use on their houses' roofs, and about the sizes and ages of trees that they can or can't cut down on their property. To obtain a fishing license, Germans must attend many hours of fishing classes, then pass a 60-question exam. Most Americans would bristle at such restrictions. But benefits to German communities include beautiful regional architecture, green cities, government support for the arts, and healthy fish populations.

At the opposite extreme comes my own city of Los Angeles, where rights of the individual property owner are prized as sacred. The result is a free-for-all, in which many individuals and communities suffer disadvantages. Almost any style of house is permissible; local architectural character is nonexistent. Tree cover is vanishing, temperatures are rising, and landowners' excavated dirt and sprayed pesticides end up on neighbors' property. To fish in the local bay waters, anyone can buy a fishing license—no questions asked—so of course fish populations decline.

The outcomes of trade-offs differ for Singapore, Germany, and L.A. because different geographies and histories have led to different customs. Population density is highest in Singapore, intermediate in Germany, lowest in the United States (including California). China—whence the ancestors of most of Singapore's population arrived—has had cities for five millennia, Germany for two millennia, the United States for just a few centuries. Chinese traditional farming is communal; Germans have close-packed individual farms; and U.S. frontier settlements had self-sufficient, widely scattered families. The cultural legacies of those differences live on today.

Another issue of urban life is the trade-off between social ties and anonymity. Traditional living arrangements still practiced today in rural areas of New Guinea, where I've been working since the 1960s, resemble those formerly practiced in pre-urban Western societies. New Guinea villagers live out their lives where they were born, constantly surrounded by lifelong friends and social support.

A first reaction of many lonely, urban Americans is: How heartwarmingly wonderful! When New Guinea villagers move to cities, they find themselves surrounded by strangers, their friends few or recent or scattered across the city. The frequent results are unhappy isolation, decline of social support, and proliferation of urban crime.

Still, we American city dwellers shouldn't romanticize traditional village living arrangements. My New Guinea friends tell me that those arrangements are also socially suffocating, and limit individuals' abilities to realize their potential. In New Guinea villages, everybody knows, constantly watches, and incessantly discusses what everybody else is doing.

As a result, a New Guinea friend who spent years living in a U.S. city loved it—because (as she told me) she could sit alone and read a newspaper in peaceful anonymity in a sidewalk café, without being importuned by fellow clan members asking her for money and bewailing their troubles. New Guineans have learned to appreciate the modern urban inventions of opaque bags and trouser pockets—because those inventions permit them to conceal things from neighbors and thereby to acquire small luxuries without becoming targets of village comment. Thus, New Guineans recognize drawbacks as well as heartwarming benefits of village life. They also understand the benefits, not just the pains, of urban anonymity.

It all comes down to compromises. As the world becomes increasingly urban, will all of us be forced to adopt more of Singapore's solutions? If a government meter that records every flushing of your toilet is part of the price you'd have to pay for living in safety, health, affluence, and beautiful surroundings, what would you choose?

Jared Diamond is a professor of geography at the University of California, Los Angeles, and the Pulitzer Prize–winning author of the book *Guns, Germs, and Steel*. This essay is drawn from his latest book— *Upheaval: Turning Points for Nations in Crisis*—which comes out in May.

CASE STUDY

The World's Most Improbable Green City

A decade ago Dubai had one of the largest ecological footprints of any city in the world. By 2050 it wants to have the smallest. Can it get there?

BY **ROBERT KUNZIG**
PHOTOGRAPHS BY **LUCA LOCATELLI**

PUBLISHED APRIL 4, 2017

To plunge headlong into the audacity of Dubai—the sprawling efflorescence of concrete, glass, and steel that has sprung up over the past three decades on the scorched sands of Arabia—you could start by going skiing. Smack in the middle of the flat city, the slope looks like a silver spaceship impaled in the ground floor of the Mall of the Emirates. Inside, you can window-shop at Prada, Dior, and Alexander McQueen before pushing through the glass doors of Ski Dubai. Passing a mural of the Alps, you zip up your parka, pull on your gloves. You begin to marvel then at what air-conditioning can do, when pushed to its limits.

The souvenir T-shirt I bought bears a cartoon of a Celsius thermometer. “I went from +50 to -8,” it said. It didn’t feel quite as cold as minus eight (14°F) on the slope, but the temperature outside can get close to 50 (122°F) in summer. The humidity is stifling then, because of the proximity of the sea. Yet it rarely rains; Dubai gets less than four inches a year. There are no permanent rivers. There is next to no soil suitable for growing crops.

What kind of human settlement makes sense in such a place? For centuries Dubai was a fishing village and trading port, small and poor. Then oil and a wild real estate boom transformed it into a city that sports the world’s tallest building, one of its densest collections of skyscrapers, and its third busiest airport. “From the point of view of sustainability you probably wouldn’t have done it here,” says Janus Rostock, a prominent architect transplanted from Copenhagen.

And yet a sustainable city is precisely what Dubai’s government says it aims to create.

Sustainable? Dubai? When camels fly, you might say. The boom years made the city a poster child for the excess that results when cheap energy meets environmental indifference. Indoor skiing is just a symbol: Dubai burns far more fossil fuel to air-condition its towers of glass. To keep the taps running in all those buildings, it essentially boils hundreds of Olympic pools worth of seawater every day. And to create more beachfront for more luxury hotels and villas, it buried coral reefs under immense artificial islands.

In 2006 the World Wildlife Fund (WWF) declared the United Arab Emirates the country with the largest ecological footprint, per capita, largely because of its carbon emissions. The shoe certainly fit Dubai, the most conspicuous consumer among the seven emirates. In the decade since, the city’s population has doubled, to more than 2.8 million. The number of cars on its roads has more than doubled. A surprising number are Bentleys, Lamborghinis, and other gorgeous gas hogs.

And yet, something else has happened since 2006: Dubai has started to change.

Gleaming driverless metro trains now run the length of the linear city, alongside Sheikh Zayed Road, carrying about as many people, and often faster, as the cars on that clogged 12-lane artery. On Dubai's southern outskirts, a new housing development has opened—called Sustainable City—that recycles its water and waste and produces more energy than it consumes. Further out in the desert, Dubai is building a giant solar power plant that will soon be producing some of the cheapest and cleanest electricity on Earth.

"The leadership has recognized that the growth of the economy is not sustainable without taking action on emissions," says Tanzeed Alam, climate director for the Emirates Wildlife Society, WWF's local partner.

In Dubai, the "leadership" is His Highness Sheikh Mohammed bin Rashid Al Maktoum, the 67-year-old hereditary emir, aka the Ruler. Sheikh Mohammed took over in 2006. He has decreed that his city will get 75 percent of its energy from clean sources by 2050. He wants it to have the smallest carbon footprint in the world. Many people I met on a recent visit to Dubai, including Rostock and Alam, believe the city might actually pull that off.

And if it can happen here, they say, it can happen anywhere.

Survival Instincts

Two places on Dubai's 40-mile-long coast frame its astonishing trajectory.

The first is Jebel Ali, home to a busy man-made port as well as an enormous industrial plant belonging to Dubai Electric and Water Authority (DEWA). It produces most of the city's electricity and drinking water in the same process: Natural gas, mainly from Abu Dhabi and Qatar, is burned to generate electricity, and the leftover heat is used to distill seawater and remove the salt. As Dubai has grown, the plant has kept adding new modules, and it's now a mile-long line of candy-striped smokestacks and evaporator tanks. It can produce nearly 10 gigawatts of electricity and half a billion gallons of desalinated water a day.

The second place is in what's left of Old Dubai, on what's called the Creek— actually a saltwater inlet. One of the few natural harbors on this coast, the Creek is why Dubai exists at all. Beat-up wooden dhows from another century still line up to be loaded with refrigerators and air-conditioners from South Korea, which they will deliver across the Gulf to Iran. Near the mouth of the Creek is the house where Sheikh Mohammed spent his childhood.

The house belonged to his grandfather, who was then the Ruler. (The Al Maktoums have ruled Dubai since 1833.) Though large, it was hardly a palace. It had neither running water nor electricity. Dubai didn't get electricity, or its first paved road, until 1961. Running water arrived a few years later. Mohammed grew up by lamplight, in a place where water was delivered by donkey cart, in barrels filled at one of the village's wells.

His father, Rashid, had grown up in the same house. In the 1930s he saw people in Dubai starve; the global depression and the invention of artificial pearls had destroyed the market for pearl diving, which was then Dubai's main enterprise. It was Rashid who began to modernize—and diversify—Dubai, after he took over as ruler in 1958, and especially after the proceeds of oil began to materialize in the late 1960s. He built roads, schools, an airport, and in 1979, a 39-story World Trade Centre, at the time the tallest building in the Middle East.

"It was built in the middle of nowhere, on the edge of the city," says Neil Walmsley, a British engineer who has been in Dubai since 2005 and is director of urban planning for Arup, a consulting firm. "It was a vote of confidence. The city responded by growing towards it"—and then well past it. Dubai was not a center of world trade when Rashid built his centre, but it is now. When he dug a giant new port at Jebel Ali, having already dredged the Creek, even his sons were baffled by his optimism. Now that port is one of the world's busiest.

The pearl business hadn't lasted forever, and Rashid knew he couldn't count on the oil. Dubai had never had more than a small fraction of what Abu Dhabi had. There's a saying attributed to Rashid: His father and grandfather rode camels, while he himself drove a Mercedes, and his son, a Land Rover. His grandson would drive a Land Rover too—but his great grandson might ride a camel again.

Unless, that is, the Al Maktoums played their cards right. In Dubai, that's the first meaning of "sustainability": finding a way to wring a good living from a hard place, ideally without having to rely on camels again. Worrying about your footprint comes later.

Toward a New Golden Age?

The Burj Al Arab, or Tower of the Arabs, was one of the first of many Dubai landmarks that Sheikh Mohammed commissioned, even before he was Ruler, in the 1990s. It's a luxury hotel built on an artificial island. As Jim Krane tells the story in *Dubai: The Story of the World's Fastest City*, the hotel could have been built on the mainland, but Mohammed and the architect decided it would make a more memorable addition to the skyline if it stood just offshore. And they were right: Shaped like a three-cornered sail rising off the sea, it's now an icon.

Arab merchants pioneered the use of the three-cornered lateen sail more than a millennium ago. As Sheikh Mohammed tells that story in his own book, *My Vision,* the new sail helped Arab dhows outdistance their square-sailed competitors. It symbolizes his aspiration for Dubai: to be the first, the best, the smartest, the fastest—to win the race against its global competitors, not just for its own sake but for the whole Arab world. He wants to make Arabs pioneers again, the way they were in the Middle Ages.

Dubai has no income tax or sales tax, and that has long made it attractive to foreigners. But in the early 2000s, it began for the first time to allow them to own property. Waves of cash flooded into Dubai real estate from Russia, from Iran, from the Arab world—from investors anywhere who were looking for a safe haven. Combined with a law that grants each Emirati citizen a plot for his own villa, it led to a surge in development. Four large developers, three of them controlled by the state, were granted great plots of land. Workers streamed in from South Asia to build new skyscrapers for the affluent. They themselves lived in camps that were often squalid, in conditions that some said resembled indentured servitude. (Read an in-depth report on Dubai's guest workers.)

The city exploded down the coast. The Dubai Marina, a dense forest of more than a hundred 40-story apartment buildings, sprung up out of nothing, to be inhabited only by expats, some of them for only part of the year. The city also pushed inland into the desert, with new villa developments for Emiratis and foreigners.

"When you look at how Dubai has been growing, it's just been this obsession with building outward into the desert," says Yasser Elsheshtawy, an Egyptian architect who has taught at the university in Al Ain for 20 years. "There were no limitations. Energy was cheap. You had cars. So why not?"

The more compelling question is why Dubai would ever change. What could prompt a Ruler with a deep drive for economic growth—who had ordered up not only a sail-shaped tower but also a skyscraper as tall as the Sears Tower with the Eiffel on top, and not only three palm-shaped artificial peninsulas jutting miles into the sea but also an archipelago of 300 islands shaped like countries and arranged in a map of the world—to develop an interest in photovoltaic panels, low-flow faucets, and walkable neighborhoods?

Crisis: "The Best Thing To Happen"

In 2008 and 2009, with the global economy on the edge of collapse, tourism plummeted in Dubai. Real estate prices fell 50 percent, oil even more. Dubai had to be bailed out of debt by Abu Dhabi. But it also got a chance to take stock.

"The economic crisis was the best thing that happened to us—a blessing in disguise," says Habiba al Marashi, founder of the Emirates Environmental Group, an organization that attempts, through education and recycling, to promote environmental responsibility. ""It slowed down the crazy pace of construction."

As the city drew its breath, three factors combined to pave the way for a new focus on sustainability, says Dubai-based energy consultant Robin Mills. The first was Masdar City, a project launched in neighboring Abu Dhabi in 2006. Billed as the world's first zero-carbon city and designed by the firm of star British architect Norman Foster, it was intended to be car free—driverless pods would ferry residents around—and to produce all its electricity with solar power.

Though the financial crisis put a crimp in Masdar City's ambitions too, it's now expanding around its compact urban core, with a new apartment complex nearing completion and plans for 5,000 homes. And the international publicity the project received from

the start helped break the resistance to green ideas throughout the UAE. When Masdar began, "it was really tough," recalls CEO Mohamed Jameel Al Ramahi. "People didn't want to talk about it. They said, 'It's too expensive! Who likes it? What's the need?'"

And yet Dubai, says Mills, was starting to feel a strong need to reduce its dependence on imported natural gas. Just before the financial crisis, when the city was at the peak of its growth, oil and gas prices were soaring. Mills, who had once been a geologist for Shell, was working on energy at Dubai Holding, a major developer in which Sheikh Mohammed holds a majority stake. "One of the issues was how Dubai was going to source the energy to power all these enormous real estate developments," Mills says.

Meanwhile a new alternative—the third factor—was emerging. Solar power was booming in places like Germany and Spain, and prices were falling fast. In 2012 Mills wrote a report saying that solar power had become cost-competitive in the Middle East, at 12 U.S. cents per kilowatt-hour. By 2015 DEWA signed a contract for 200 megawatts worth of solar panels that would deliver power at 5.6 cents per kilowatt-hour—a world record-low. At that price, it was making a profit on solar.

"For the utility, that was a eureka moment," says Saeed al Abbar, head of the Emirates Green Building Council. It was founded in 2006, when the boom was at its height.

Endless Sun

By the time I visit the Mohammed bin Rashid Al Maktoum Solar Park at the beginning of February, DEWA has shattered that record: Masdar's parent company—the largest exporter of renewable energy in the Middle East—has agreed to furnish the next 800 megawatts of power at 2.99 cents a kilowatt-hour. "Solar is clearly by far the cheapest form of electricity," Mills says.

The site, about 30 miles southeast of the city, was chosen for its insolation, a DEWA engineer says. We climb out of the shade of a transformer building onto its roof to gaze out over the field of solar panels, slanted toward the sun. They already cover well over a square mile and produce 200 megawatts, two percent of DEWA's total generating capacity, but there's room for a lot more—a thousand megawatts will be here by 2020, 5,000 megawatts by 2030, DEWA says. And unlike some utilities in the United States, which see solar power as unwelcome competition, it's also actively encouraging citizens to put solar panels on roofs.

"The solar potential is so great here," Mills says. "Millions of acres of empty desert, and plenty of roof space. Electricity generation—for me it's almost 'problem solved.'"

DEWA, however, is afraid to count on any one solution, however limitless. So by 2030 it plans to get seven percent of its electricity from four nuclear power plants that Abu Dhabi is building; the first is expected to switch on this year. More troubling, DEWA is constructing a plant that will burn coal. It'll have to be imported, probably from Australia or Indonesia. The electricity will cost 40 percent more than solar power. It makes neither environmental nor economic sense—other than as a hedge against Dubai's nightmare, an energy shortage that might limit the growth of the city.

Building Greener

After the profligate boom years, Dubai is also attempting to restrain demand for electricity and water. Prices used to be heavily subsidized, but DEWA raised them substantially, and introduced a progressive scale that rises with consumption. Dubai residents now pay roughly as much for electricity as I pay in Washington, D.C., and about 50 percent more for water—unless they happen to belong to the 10 percent of the population who are citizens of the UAE. Citizens pay less.

New buildings in Dubai aren't built as if energy and water are limitless, says Al Abbar. Old buildings from before the boom weren't either: Sheikh Mohammed's boyhood home featured thick walls, small windows, and wind towers that caught the breeze and funneled it into the shaded courtyard where he played ball. Even the World Trade Centre had deep-set windows and white walls to reflect the heat. But if you stand on its 31st floor today, in the offices of Sheikh Mohammed's educational foundation, you look out over a city of glass towers.

"There is an expectation from the tenants—they want to see floor-to-ceiling glass," Al Abbar says. Developers can't necessarily fight their clients' desire for spectacular views, he adds; an unoccupied building is an unsustainable one.

Since the economic crisis, Dubai has tightened its green building regulations, as part of a strategy to reduce energy demand by 30 percent. New buildings must have solar water heaters, as well as operational systems that lower lights and thermostats when people are absent. To reach the city's goal of retrofitting 30,000 older buildings, regulations allow third-party contractors to renovate buildings and take their profits from a portion of the energy savings. "What I've seen is a huge change," Al Abbar says.

The city government is not just imposing rules on building owners, says the municipality's director general, Hussain Nasser Lootah, an engineer by training. It's also collaborating with manufacturers on rolling out efficient products for the Dubai market. Philips is making a one-watt LED bulb that will soon be in buildings across the city, Lootah says. And a new Scandinavian low-flow faucet will be installed in all the local mosques this year, *inshallah*. Observant Muslims practice ritual ablutions before prayer five times a day, washing face, hands, and feet. "They use too much water!" Lootah says. The new faucet delivers 40 percent of the water with 100 percent of the noise, reassuring the faithful that they're being adequately cleansed.

Faris Saeed, developer of the Sustainable City, which stands (for now) on the edge of the sprawling and less sustainable one, traces the origin of his own project to the financial crisis. A Jordanian engineer who has lived in the UAE since 1995, Saeed runs Diamond Developers. At the height of the boom, he built six towers containing 1,300 apartments in the Dubai Marina. Those days are gone now. "We took a decision as a company that we could never go back to business as usual," he says.

Saeed's new development, which will eventually include a school, hotel, an "innovation center," and a riding stable, currently consists of 500 villas on a compact 114-acre site. The L-shaped houses stand close together on narrow, verdant streets, facing north, such that they shade each other—sun falls onto the windowed facades only in the early morning and late afternoon.

That simple design choice, Saeed says, allows the air-conditioning units to be 40 percent smaller. Extra insulation, reflective windows and paint, and LED lights further cut energy consumption to around half what would be expected for a 3,000 to 4,000 square foot villa in Dubai. "It's a myth that sustainable has to be more expensive," Saeed says.

The Sustainable City produces more electricity than it consumes, thanks to solar panels that shade roof terraces and parking lots. Each roof also has a solar water heater. All waste is recycled—the organic stuff is composted and used in a series of dome-shaped greenhouses that occupy a "farm" at the center of the development. "We're self-sufficient in herbs," a public relations person says. For other food, residents can walk to the grocery store, just off a central plaza that will be lined with restaurants. On summer evenings they can sit and watch their children play in small squares cooled by wind towers, like the ones at Sheikh Mohammed's boyhood home, but augmented by fans.

For this sustainable idyll, Saeed says, residents will pay no more than they would at one of the other developments nearby. He'll even throw in a $10,000 subsidy for an electric car, which leads to the one apparent flaw of Sustainable City: It's a longish drive from any of the multiple centers of Dubai.

The Curse of the Grandchildren

On a wall in Lootah's office, a framed series of aerial pictures shows how Dubai has evolved since 1935, when it was an impoverished fishing village huddled around the Creek. At the center is a visualization of the future: It shows a coast even more clogged with artificial islands and peninsulas than it is today. This city has no intention of slowing down. It lives off its expanding footprint: Nearly a quarter of the population works in construction.

Less than a decade ago, tanker trucks were pulling up to modern apartment buildings to pick up sewage, some of which was dumped illegally in the desert. Now nearly all parts of the city—all but the industrial areas and the labor camps, Lootah says—are connected by pipes to two modern sewage treatment plants. A third plant is about to open, and Lootah expects to build several more to keep up with growth. Dubai sees its population doubling, to more than 5 million, by 2030.

"When I was in the States," Lootah says—in the late 1970s he studied in Pittsburgh, and after that proved too cold, Arizona —"people asked where you come from. 'Emirates? Where is this? Where is Dubai?' Now, you ask anybody: They say they love to come to Dubai!"

Lootah credits the Ruler with putting the city on the map. A large portrait of Sheikh Mohammed hangs behind Lootah's desk, as it does in most Dubai offices. A two-story-high portrait hangs on the façade of the municipality building, alongside that of the Emir of Abu Dhabi, who is president of the UAE. (Sheikh Mohammed is vice president.)

All over Dubai, from Emiratis and expats alike, I heard testimonials to the decisive leadership of Sheikh Mohammed. "We don't have a lot of formalities," Lootah says. "Here projects take days to be done, elsewhere years." It's not just the lack of red tape that speeds things up—it's the lack of democratic institutions. Without a free press, political parties, or free elections, there's little chance of public opposition to projects endorsed by the Ruler.

Planners of Washington, D.C.'s Metro system started sketching a Silver Line to Dulles Airport in the late 1960s; it's still not finished. Dubai's Red Line, of comparable length, was planned and built in less than a decade, and its first stretch opened in 2009, at the height of the financial crisis. Even sustainability mavens, aware of how much needs to change, find a lot to cheer in the can-do spirit that trickles down from the Ruler.

"This country has developed so quickly," says Tanzeed Alam of WWF. "It can change quickly too—because the leadership gets behind it."

"As long as they're making decisions that are good and make sense," the lack of democracy "is not that big an issue," says Janus Rostock, chief architect in the Dubai office of Atkins, the firm that designed the Metro, the Burj Al Arab, and most recently, the Dubai Opera, which is shaped like a dhow and opened last year.

Between 2011 and 2016, while the population of Dubai grew by 35 percent, water and electricity consumption grew a bit slower—in other words, per capita consumption is falling, a sign that city efforts are bearing fruit. Per capita carbon emissions have fallen dramatically since the UAE's world-champion days, according to Dubai Carbon, a government think tank. They're now comparable to those of the United States, at less than 18 tons per year. "Dubai is pursuing carbon-neutral growth," says Ivano Iannelli, who heads Dubai Carbon. "The idea is not to increase emissions" as the population grows. But for the foreseeable future, total emissions will keep rising.

Dubai residents may emit no more carbon than average Americans, but they emit nearly three times as much as the average residents of New York City. That's in part because of Dubai's legacy of heedless expansion—it's a sprawling, car-centered city built to be taken in at 75 miles per hour, Rostock says.

He and others are trying to change that. Rostock has led an effort to transform the area around the Burj Khalifa ("a fortress," he says) and the new opera into a district of ground-floor shops and restaurants that invites people to stroll. And near the Mall of the Emirates, Sheikh Mohammed's own Dubai Holding has master-planned a mile-long development, called Jumeirah Central, where hundreds of apartment and office buildings are to be laid out on small, walkable blocks. They'll be linked by trams and gondolas to the Mall and its Metro stop.

Hereditary rulers, it's sometimes said, can take a longer view than democratically elected ones. Habiba al Marashi tells me about another saying attributed to Sheik Rashid: Humans need to live in harmony with nature, she says, paraphrasing the father of modern Dubai, "so we have the blessings of our grandchildren and avoid being cursed by future generations."

But Rashid also didn't want his descendants to have to ride camels again, and if Dubai succeeds in its current shift toward sustainability, it will be for reasons of hard-headed economics. Dubai is pivoting now, says Rostock, because it has to—because it's competing with other global cities for business and people, and sustainability is in.

"What we have is a willingness and a push to change Dubai and how it's perceived by the world," Rostock says. "Dubai is unique in its dependence on the surrounding world. Dubai doesn't have the oil. It has to be attractive to two billion people within a four-hour flight."

People in Glass Houses

On my last evening in Dubai, I finally went skiing. It's a peculiar experience: You're in a giant fishbowl, being watched through tall windows by people in the mall. But it's real skiing, with real snow. As my legs fell into the familiar rhythm, I felt the old familiar pleasure. In a former life, I had spent many winter holidays in the French Alps, and this reminded me of the bunny slopes where my children had learned to ski. To be sure, the only Alps here were painted ones—but there were plenty of real and happy children, playing in the snow and cutting in front of me in the lift line. They seemed blissfully unaware of the unsustainability of their activity, though I admit I didn't ask.

Once we've converted to solar energy, we won't have to worry about carbon emissions from air conditioning, even on ski slopes. Dubai and the UAE could easily pioneer that transition. By the time the whole world makes it, however, it may get very hot along the Persian Gulf. In Dubai at the height of summer, people already go outside as little as possible. By 2100, according to one recent study, there may be days so hot and humid that going outside could kill you.

Water may become a choke point even sooner. At the National Center of Meteorology & Seismology in Abu Dhabi, meteorologists monitor every cloud that passes over the UAE; if a cloud looks promising, the pilot of one of six planes on standby 24/7 is guided to the right spot to seed it with salt crystals. Researchers say they can tease a few extra millimeters of rain out the atmosphere each year, which helps a bit to recharge the country's depleted and polluted aquifers.

But those are drops in the bucket; Dubai will always depend on desalination for its drinking water. The problem is not so much the tremendous energy it takes—that will eventually come from the sun—but the hot brine that's left over and discharged into the Gulf. A shallow, almost closed sea, the Gulf is already 20 percent saltier than the ocean, and it's getting saltier: In addition to the hypersaline brine pouring into it, dams in Turkey and Iraq are diverting fresh water and climate change is increasing evaporation. In time the Gulf could become too salty to desalinate economically or to support much in the way of marine life. "We still feel we can cope," says Lootah. With technology, "everything is possible."

Should this city even be here? I put the question to Tanzeed Alam. We're sitting in the Sustainable City—where the Emirates Wildlife Society is about to move into new offices "to walk the walk," he says—but I'm asking about Dubai.

"That's the wrong question," Alam says. "It's more about accepting where we are today, and how do we make that better. It's a question of the right to develop, and of human beings' right for a better future. How do we make cities better?"

At Ski Dubai, I don't stop at the wooden chalet in the middle of the slope, where you can sip hot chocolate in front of an open fire. I'm in a hurry to get on my 14-hour flight back to Washington, where the traffic is among the worst in the U.S.; where the Metro system is on the edge of collapse; where, because of my apartment's antique heating system, I must leave the windows open in winter to keep the temperature inside below 80 degrees; and where the new administration has promised to dismantle government efforts to address climate change.

As I drive to the airport, a light, tentative rain begins to spatter the taxi's windshield. I take it as a hopeful sign.

This article is part of our Urban Expeditions series, an initiative made possible by a grant from United Technologies to the National Geographic Society.

Photographer Luca Locatelli worked on the feature story "Germany Could Be a Model for How We'll Get Power in the Future" in the November 2015 issue of the magazine.

Robert Kunzig is senior environment editor at *National Geographic* magazine.

Luca Locatelli is a photographer and filmmaker based in Milan, Italy.