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JASON INCH

**LOHAUS**

# LOHAUS

A  
LIFESTYLE  
OF  
HEALTH  
AND  
URBAN  
SUSTAINABILITY

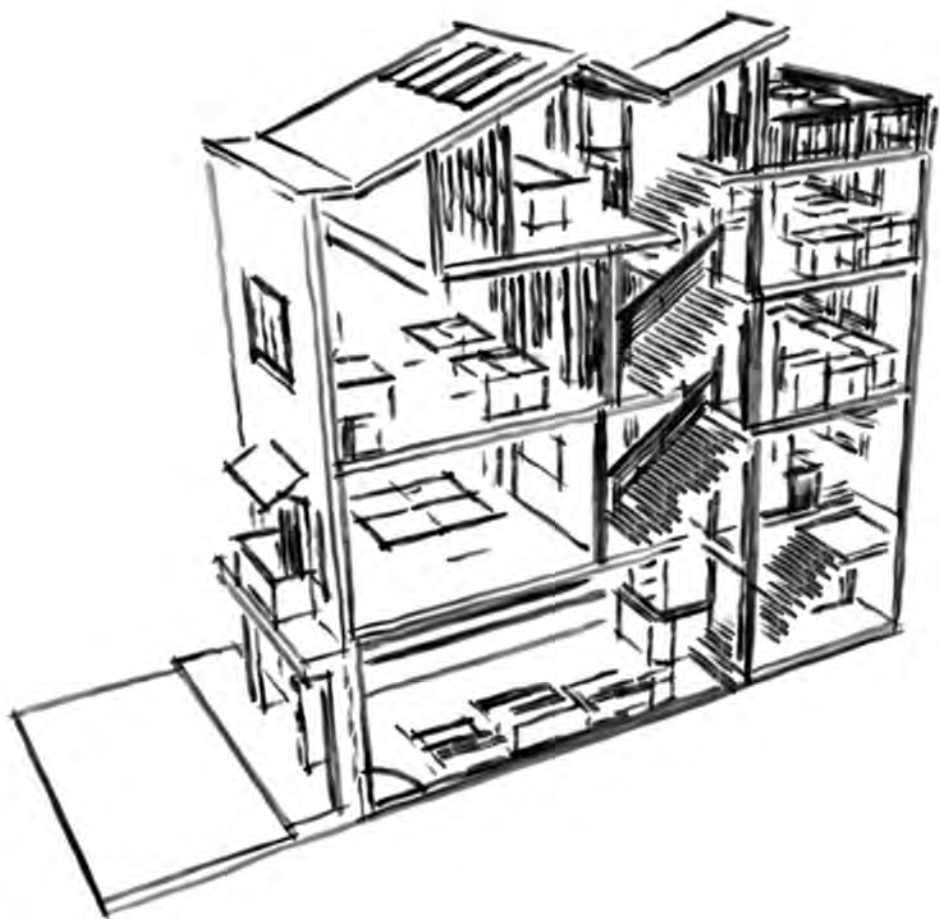
JASON INCH





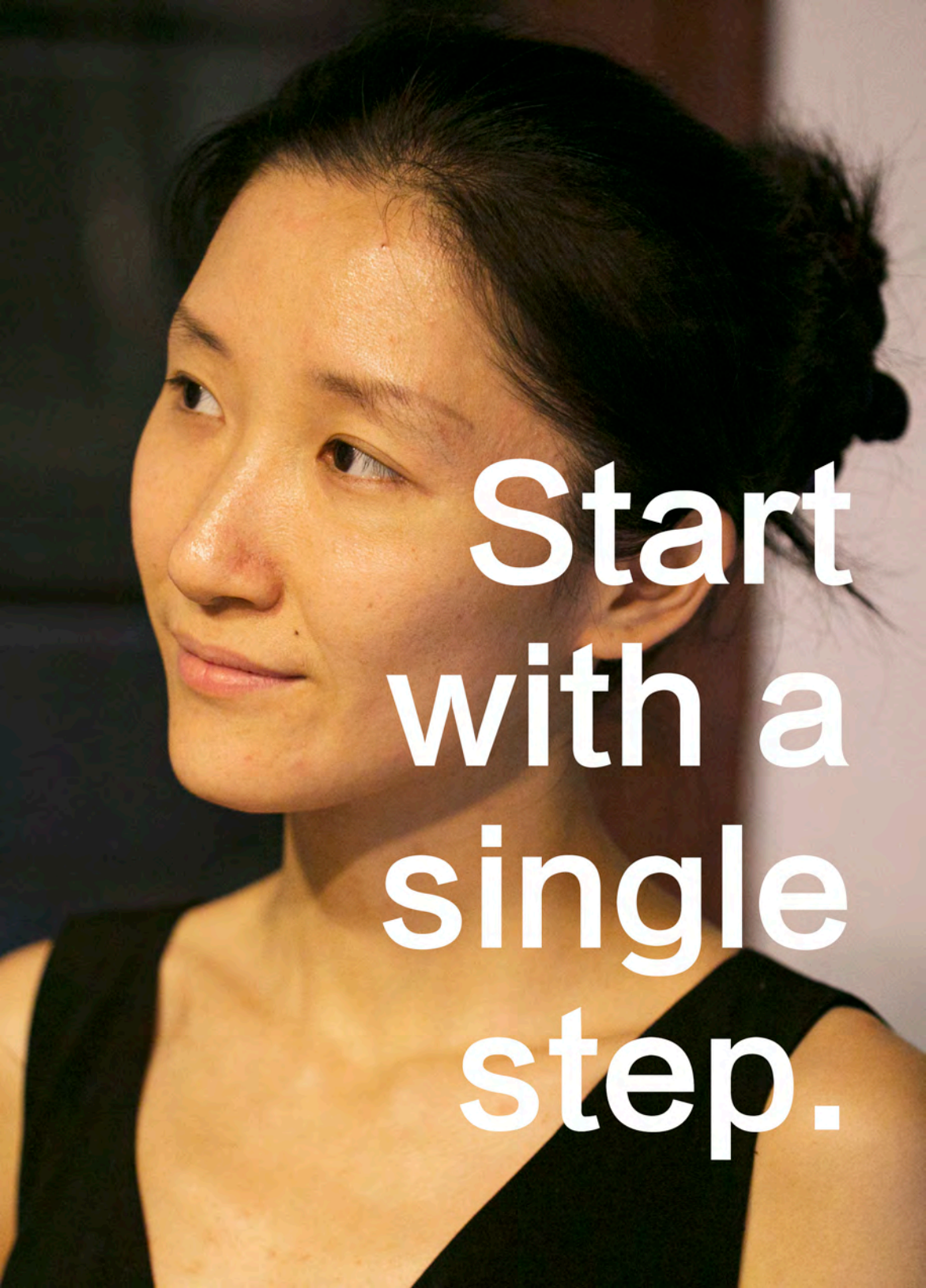
LOHAUS

乐豪斯





Where  
do we  
start?



**Start  
with a  
single  
step.**

A small white plastic planter with a scalloped edge and a white plastic frame. Inside the planter is dark brown soil and a small green basil plant with several leaves. The planter is sitting on a brown surface. In the background, there is a blurred green plant.

You  
can  
start  
small.





**Then  
watch  
your  
work  
grow.**



Start with  
yourself.



Spread  
the word.



Find  
inspiration  
within.

L  
O  
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S

50  
永福路

OPEN



**LED:  
for bright  
ideas.**



**Work  
and  
have a  
coffee.**



2UAHOJ  
祺豪永

Aquaponic  
growing.



Our door  
is

OPEN



# **LOHAUS**

**A Lifestyle of Health and  
Urban Sustainability**

**Jason Inch**

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ISBN:

ISBN-13:

*For everyone who has been to the Loft of Health and  
Urban Sustainability, and for anybody who wants a  
Lifestyle of Health and Urban Sustainability.*



# CONTENTS

	Acknowledgments	i
	Preface	iii
	Introduction	1
1	Locanomics	29
2	Better Breathing, Better Life	69
3	Net Zero Buildings	95
4	Smart Cities	129
5	The End of Work?	145
6	Big Data	183
7	3D Printing	195
	Next Steps	217
	About the Author	233



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## **PREFACE**

This book is about a place. It is also about a concept. For reasons you will soon understand, both place and concept are called LOHAUS. The events and activities described herein are primarily set in my adopted country of residence, which is China, but also concern my homeland, which is Canada. They also concern and have been influenced by the places I have lived in between, including the United States and Japan, as well as places I have visited around the world. Everywhere I go, I take something home with me, literally or figuratively, sometimes both. This book is what I will leave behind. It is my hope that you, the reader, will take something from this book, and leave something behind for somebody else to find.



## INTRODUCTION

**T**he question that we – my business partner Andrea Liu, as well as our staff and collaborators – are most often asked is, why we established a Loft of Health and Urban Sustainability – what we call a LOHAUS – in downtown Shanghai. More recently, this question takes the form of why we are now trying to extend LOHAUS beyond the physical building, into a global *lifestyle* of health and urban sustainability.

The simple answer to both these question is that we care. We care about our families. We care about our neighbors. We care about the people who share the city in which we live. We care about everyone on our planet, in fact. And we even care about the future generations yet to be born. That's a lot of people to care about, and caring for so many is not an especially easy thing to accomplish beyond the feeling of goodwill, so

let's just put it this way: We care about you, the reader. Wherever you are, whoever you are, this book has been written for you.

And we hope that by the end of this book, you will understand what a lifestyle of health and urban sustainability means in terms that are important *to you*. We have no illusion that everything we think and believe about health and urban sustainability is going to fit everybody, everywhere. Far from it.

I just wrote how we at LOHAUS care about everyone, our families, our neighbors, everyone alive today and even those not yet born. Well I left somebody out. Actually *somebodies*. We care about ourselves. Being empathetically altruistic toward others all the time without regard to our own needs is hardly practical, for us or anybody else. At the same time, we don't want to be ignorantly self-interested, thinking entirely of our own needs, either.

Combining the two opposing approaches to life, however, results in a state of being I call empathetic self-interest. Reduced, but never entirely lost, are altruism and ignorance. Throughout our lives we will strive to increase one and reduce the other. But the essence of making the world a better place for everyone is empathic self-interest.

## LOHAUS

I believe that for any positive change to affect both you and the greater world around you, it must satisfy two conditions. One, it needs to have an emotional connection and positive meaning to at least one other person. In other words, it has the potential to make their life better. Two, it has to make your life better. A simple example: Many people believe that a vegetarian diet is the superior choice, but if by switching to this diet, I feel I lack energy, or lose too much weight, or simply don't enjoy the taste, should I give up my own self-interest and happiness? I should not.

There is a corollary to the first two conditions. If you still want to take up or persist in a behavior that other people disagree with, you are of course free to do so, but maybe you can find a way to do it better, differently, or with less negative impact on them. I call this enlightened decision-making and altogether read it as empathetic and enlightened self-interest.

For example, if you smoke cigarettes or cigars, despite all the scientific studies showing that tobacco smoke is toxic and the social disapprobation that goes along with such behavior, you could at least smoke away from the presence of others. If you like to eat meat, make sure your vegetarian friends have enough choices at your dinner party, otherwise they probably won't be

coming back. Better yet, why not try one day a week where *you* will be a vegetarian, and see how it feels? That's empathy. Understanding the arguments for and against, and knowing that a middle-ground to either meat-eating or vegetarianism can exist, that's enlightenment. Wanting to keep them as friends, that's self-interest.

Incidentally, after much consideration of arguments for and against, as well as taking my personal situation into account, I am not a vegetarian. I do, however, enjoy several vegetarian meals each week, eat two or more varieties of soy daily, including tofu and soy milk, and try at least one day a week to eat only vegetable and dairy products. And, it is my ambition to eat a diet free of animal protein entirely once lab-grown meat-like protein substitutes become widely available. Furthermore, understanding the resources that go into producing a kilogram (2.2 pounds) of beef that might be raised in Australia and flown to China, I rarely eat beef, and am more likely to eat locally sourced pork and chicken. On balance, I do the best I can with the resources I have, but I always strive to do better. That is, I hope, empathetic enlightened self-interest.

So, when it comes to living a life of health and urban sustainability, we all must make a decision to do something ourselves first, not only because

## LOHAUS

we want to help others, but also because we want to benefit our own lives. If you are not willing to do something, preaching to others will get little response. On the other hand, if you are doing something entirely for others, without benefit to yourself, you may quit due to lack of motivation.

I don't expect you to read this book and think that one hundred percent of the ideas are great for the world and a perfect fit for you, and decide that you are going to follow them. Rather, I hope that you will be selfish, yes, selfish enough to make a decision that is right *only for you*. Change something in *your life first*. If you are not even willing to change yourself, there is little hope that others, whether your family, friends or the greater community, will follow.

### **WHERE DOES LOHAUS COME FROM?**

The *second* most common question we are asked is where the name LOHAUS comes from.

LOHAUS is an acronym, which stands for Lifestyle of Health and Urban Sustainability. In the first iteration of LOHAUS, the 'L' actually meant Loft, and represented the physical loft building where we first established our social impact company. That is only the literal part of the name. In fact, LOHAUS, as a *lifestyle* concept, draws its inspira-

tion from two diverse movements established decades apart -- LOHAS and Bauhaus.

LOHAS, which stands for Lifestyles of Health and Sustainability, is hard to define in terms of a single founder or when it started. It emerged from the social consciousness that began in the United States and Europe in the 1960s, which grew into the environmental movement of the 1970s and 1980s, and turned into a mass consumer trend in 1990s, especially in Asia where it was embraced by newly affluent consumers in places like Japan, Singapore and Hong Kong.

The other movement, Bauhaus, was created by a small group of people in Germany in the 1920s and 1930s, as an answer to the perils of industrialization and the neglect of human needs in architecture and design.

## **THE LOHAS LIFESTYLE**

There have always been people who want to live a healthy life in a sustainable way. The description of a healthy life is something most can agree on as long, happy, and free of chronic illness. But it might include more abstract concepts such as mental health and spiritual health, family health and community health. For sustainability, let's however put aside for the moment a definition,



## LOHAUS

which I will instead address in several forms – environmental, economic and social – later in this introduction and throughout the book.

### *The Case for LOHAS*

For a number of reasons, urban living has become the norm in much of the developed world. Urbanization rates are at 70-80% in much of the developed world, and even higher for city-state countries like Singapore.

The focus on convenience and speed in city living means that we no longer travel like natural human beings once did, on foot. Instead we spend our lives being carried from place to place in cars, on subways, and bicycles. We go up and down heights by elevators and escalators. We sit at desks all day long staring at computers. In short, our level of natural movement has decreased dramatically and our level of unnatural inactivity (such as sitting in an office chair) has increased proportionately.

This lifestyle has created a variety of new risk factors for so-called knowledge workers: repetitive stress injury, including carpal tunnel syndrome, neck and back pain, eye strain, and more serious chronic illnesses from heart disease to diabetes. The rates are up all over the world, but especially

in the most developed, richest economies with the highest number of white-collar workers. Today these lifestyle afflictions are becoming something akin to gout, once known as the king's disease for its tendency to strike those who ate rich foods and large quantities of meat. Today it is our sedentary lifestyles, combined with diet, that make those problems ever-more prevalent.

Even in China, all of these problems have increased sharply during the country's miracle 30-plus years of economic growth in which the nation came to have the second biggest economy on Earth or, as I say, the second biggest girth.

It isn't our sedentary habits alone that are responsible for this literal and figurative girth. We are still eating three meals a day; it is the food that has changed. We are eating more manufactured, processed foods, containing more chemicals and carbohydrates (sugars) than ever before. One of the main culprits: high fructose corn syrup. It tastes great, which is why you find it in almost every manufactured food in the grocery store.

At work we might eat in a company cafeteria that offers food that is filling and cheap to produce – pastas, breads, rice and other grain-based foods.

Or we use our limited lunch breaks to eat hastily prepared meals at small restaurants with poor

## LOHAUS

sanitary conditions, or at international fast food chains that offer expired meat and chemical-filled sauces and drinks.

Trying to control our food intake by shopping more carefully may not even work. Our store-bought and home-cooked foods are still filled with pesticides, growth hormones, antibiotics and more. We try to make up for the nutrition we've lost by eating more vitamins and supplements, taking pills and powders, as we feed our infants protein formulas instead of mother's milk.

Quite simply, we need LOHAS to get back to a way of life that is healthier.

We also need LOHAS to create a more sustainable world. What does sustainability mean? It depends whether you are talking about economic sustainability, environmental sustainability, or some other kind. LOHAS is primarily concerned with the environmental variety.

When it comes to environmental sustainability, I like to think about the old Boy Scout rule, that we should leave the campground better than we found it. Even if somebody else messed it up, we should clean it ourselves before moving on. Unfortunately, for decades we have been taking from the environment without leaving much behind,

except for our garbage. There are now quite a lot of messes to clean up.

Just one of the issues we should think about is our carbon footprint. If you believe that increasing amounts of carbon dioxide (CO<sub>2</sub>) and methane – also known as greenhouses gases – will build up in the atmosphere and cause global warming, which will raise sea levels and cause subsequent disasters on a scale never before seen by humans, then you should be concerned about your carbon footprint.

This is the amount of carbon dioxide or equivalent released into the atmosphere for any given human activity. Driving a car, flying an airplane, even riding a bike all, at some level, result in the release of CO<sub>2</sub>. Wait, you say, a bicycle doesn't burn fossil fuels. Well, if you consider the materials and production process of the bicycle, or how far the finished bike was transported over sea and land to get from the factory to the store where you bought it, it has a carbon footprint. Not as big as that of a car, which uses far more materials and transportation volume before ever being used by a consumer, but even the bicycle has a carbon footprint. Unlike a car, a bike doesn't burn fossil fuels. Wait! What did you eat for lunch before that long afternoon ride through the countryside -- did it contain a lot of high-carbon beef and flour in,

## LOHAUS

say, a hamburger? Over the lifetime of that bike, the carbon footprint is likely to be lower than for almost any other form of human mobility, but it is still not zero.

Being carbon dioxide positive means you are putting more carbon dioxide into the atmosphere than you are taking out. Most human activities are of this kind, so it is really not positive at all, it is actually a bad thing from the climate's perspective. Carbon neutral means the amount of carbon dioxide created and the amount taken out of the atmosphere, perhaps because you bought carbon credits to offset your journey by airplane or planted some trees, are in balance. The Holy Grail includes activities that are carbon dioxide negative, which actually take out more carbon dioxide than they create. So-called carbon sequestration technologies, including injecting CO<sub>2</sub> gas collected from the atmosphere into permanent storage below the Earth's crust, are carbon negative processes that today are more theoretical than real. So greenhouse gas concentrations in the Earth's atmosphere are going up, and will likely continue to do so, for the foreseeable future. Not very sustainable, when you look at it that way.

To achieve environmental sustainability, one initial step is to realize that everything has a cost. The problem is that, traditionally, many of these

costs are not included in the calculation of the price of any given activity. They are hidden costs. Or, as economists call them, externalities. Yes, they really do call them that. And, at the level of the planet, we are in a zero sum game, so every dollar counts. There's only one Earth, after all. Sure, some people might point to the moon or asteroids and say, look at all those resources! But can you find fish on the moon? How about getting clean air from an asteroid?

I'm a technological optimist, meaning that I think we'll eventually find solutions to the problem of, say, over-fishing the oceans before we actually collapse the biosphere on top of ourselves. Even so, today's drift nets and bottom trawling are still pretty scary ways of providing our seafood. So, as an optimist, I temper my hope with the reality that with every new technology, new problems seem to occur. Blindly assuming that, one day, technology will solve all our problems and make the world better than it was before we found it, is what I call technological utopianism. Almost as bad is Luddite Utopianism, or a desire to go back to a simple time where there were no machines at all, assuming life would be so much better without them. In today's world, we cannot live without the support of technology. Our population would collapse without modern medical, agricultural,

## LOHAUS

and communication systems, to name just some of the technologies we now depend on.

### *The Case Against LOHAS*

People seeking a healthy and sustainable life have pursued it in many unique ways, but they usually share a common ideal of a simpler life. It is hard to disagree that a simpler life has a certain attractiveness in its balancing of people with nature. For evidence that this is a timeless desire, one can look back to the writings of Henry David Thoreau or, even further and more abstractly, the philosophies of Taoism or Stoicism. All attempted to promote a life in balance and harmony with others and with nature.

Returning to a simpler life in the countryside or suburban areas, while leaving behind the urban sprawl, has now become the goal of many. The modern problem is that the ideal of achieving this simple life for some has begun to take the place of finding real solutions to the problems that everyone else has. This withdrawal to a simpler life away from complex city life, without consideration for the problems left behind, ignores what others are going to deal with as a result. It is, in other words, ignorant self-interest to believe that your withdrawal from society won't have an adverse impact. You will still need many of the

things that society provides, you just will not contribute back to the betterment of that society.

While this seems like an attack, it is not, it is just a matter of fact. I do believe in the right of those people to do whatever makes them feel happy, as long as they are doing it in an empathetic and enlightened way. In rural America, Canada and Australia, I love the roadside farmers' stands and co-op markets that dot the roads and highways. The farmers' work brings fresh produce to a local population that, given the state of today's global economy, might instead eat something that was imported from a continent away. Those farmers enjoy their rural existence, but they have not withdrawn from greater society. Contrast this with a more independent kind of rural living, which some are beginning to call *off-grid living*.

One form of living *off the grid* means not relying on the electric company or other utilities. This might include generating your own power with smaller wind turbines or solar panels. Or it might mean going without electricity altogether. In extreme cases, *off the grid* means living completely without connection to the outside world. This might include living off the land, like Robinson Crusoe, except today's Robinson Crusoes are marooned on purpose and have no desire to return. Less radical *off-the-grid* lifestyles might include



## LOHAUS

living on a farm in a rural area far away from the city, surrounded by livestock and vegetable plots, and of course lots and lots and canned goods. Such a lifestyle in the United States might also include guns and a “prepper” mindset – the idea that society is in for some major catastrophe, and somebody who is prepared for it is more likely to survive.

The concept of *off-grid* living might seem idyllic, and the apocalyptic life scary, to most, but it is not truly scalable across the entire population, or even a small part of it. Nor does one person or one family make a society. Growing your own food and generating your own electricity but living without community is not my idea of a happy life, though it sounds idyllic to some. And, while one might survive a natural disaster or societal collapse by riding out Armageddon hiding in an underground bunker for years, it is a mindset more about negativity than empathetic enlightened self-interest.

Even without the extreme of off-grid living, this LOHAS movement of Lifestyles of Health and Sustainability has still at best become a catch-all term. It can cover holistic medicine, yoga, and wellness, and all of the products and services necessary to provide them, as well as solar energy, biodiesel and electric cars. At worst, it is a

marketing buzzword and enabler of false claims to eco-superiority of certain lifestyle choices.

Like a computer that has become bloated with too many applications and files, LOHAS needs a re-boot, if not a complete reinstall. I started thinking about what LOHAS was missing. The answer is that the LOHAS movement is missing one crucial angle – the urban one. This is where we differ from many traditional environmentalists. We support urban living. And we want to find a way to make it more sustainable.

So, to limit the scope of LOHAS, I added the letter “U” for *urban*. I believe that life can be nice in suburbs or rural areas, and it is relaxing to get away to the peace and quiet of the countryside. But our future as a society – a sustainable future that will last into the next century and allow the population to increase to its expected peak of more than nine billion before it stabilizes – requires that most people be in cities. There is simply no other way to support so many people on our planet while providing them with quality health care, education and other services. The future of our world is an urban world. What that will look like will be explored in the remainder of this book, in the form of principles for urban living that will allow both the population to grow and

## LOHAUS

the cities to become more robust and better places in which to live.

But what should those principles be? This is where I draw inspiration from the second movement mentioned at the start of this introduction. It is a movement from more than 90 years ago, yet one that still has relevance today for its foresightedness and its simplicity. This movement is called Bauhaus, and you might know it best as a kind of furniture, but it really is so much more.

### **BACK TO BASICS WITH BAUHAUS**

In order to take control of our work and personal lives, we actually need to look to the wisdom of the past.

One approach that has brought much value to our work at LOHAUS forms part of the inspiration for our name: the Bauhaus architecture and design movement from Germany in the 1920s.

Bauhaus is variously translated into English as “School of Building,” “Construction House” or “Working House,” but is generally taken to mean what it did, which was to explore new education methods in design and architecture. It had schools in three locations during its brief tenure, from 1919 to 1933.

A group of intellectuals, led by the first director of the school, Walter Gropius, formed a holistic approach to learning, living, and working together. They combined modernist concepts from architecture, design, art, sociology and other fields in an attempt to create a unified movement that captured people's hearts and minds.

If it were possible to summarize Bauhaus in a sentence, it might be to consider a building as more than just a structure, and instead think of the purpose that the building would be put to, the needs of the occupants of the building, and the integration of the art and design of the building – thereby creating a *zeitgeist*, a unified vision of something that was more than the sum of its parts.

In fact, Bauhaus was so much more, but several concepts from the Bauhaus school are the unifying principles that allow LOHAS to combine with urban sustainability, forming what I now call LOHAUS, a lifestyle of health and urban sustainability.

### *Simple is better*

A core concept of Bauhaus was to embrace simple design. A related concept was minimalism, embracing simple objects and primary colors in art

## LOHAUS

and other fields. Here is a version of the LOHAUS logo, as inspired by Bauhausian minimalist ideas:



The logo uses only one shape, a parallelogram, which is repeated to form the pattern of the roofs found in the community where our LOHAUS building is located. The characters in the font itself are sans-serif, meaning they have no decorative lines, or serifs; instead the lettering is clean and simple in its English version. For the Chinese font, we also picked a simple style. The Chinese characters mean, in translation, *happy house*, but the last two Chinese characters are part of the Chinese word for Bauhaus. Throughout our first LOHAUS building, we strove to make everything simple and minimal. People have responded that they enjoy the lack of distractions and find a clean desk in a spare room to be the best place to focus.

Bauhaus concepts have undergone something of a modern revival, thanks to several well-known architects, artists and other individuals claiming to have drawn their styles from Bauhaus inspiration.

It was said, though rarely if at all by the man himself, that Steve Jobs was deeply inspired by Bauhaus and the ideas of its founder, Gropius. This apparently led to design elements and functions of modern Apple products, such as the Macintosh computer's use of elegant typography, which revolutionized desktop publishing, or more recent iPad and iPhone applications that used skeuomorphism – designing something to look like another thing – such as a calendar application that looks like an actual paper calendar. By Jobs' reasoning, people would thus find the computer easier to use, friendlier and less technological.

Jobs seemed obsessed with such ideas as skeuomorphism, even as advances in technology such as touch-sensitive screens for mobile phones and tablets made it possible to explore entirely new interface approaches. All the while, Jobs endeavored to keep the interfaces as simple and minimalist as possible.

His successors at Apple, including the head of Apple's designs Jony Ive, are now beginning to move away from Jobs' design vision. This is apparent from the differences between iOS7, the first major operating system release after Jobs' death in 2011, and previous versions, including iOS6 and earlier editions of the operating system for Apple's phones and tablets, which were over-

## LOHAUS

seen by Jobs. While still minimal in his design aesthetic, Ive has moved away from skeuomorphism.

LOHAUS tries to make everything as simple as possible, up to and including the business operations of the physical building and the activities we promote to encourage health and sustainability in the city. As wonderful as simple is, sometimes it might be a little boring, which is why we use other elements from Bauhaus to make things more interesting.

### *Creativity and Interaction*

Bauhaus emphasized what we might today call “Out of the Box” thinking. The students of the Bauhaus school took classes that encouraged individual thinking, exploration, and project-based learning rather than studying a textbook. Bauhaus lecturers rarely used rote learning or lectures as a teaching methodology.

This was partly because the Bauhaus was populated with a diverse array of lecturers and students, not just architects and designers. It emphasized that cooperation and collaboration between diverse groups of people could have potential benefits, such as cross-pollination of ideas. This contrasted with the then-prevalent focus on tradi-

tion and dogma in education. As in the Bauhaus, in LOHAUS, entrepreneurs work alongside artists, designers, writers, and other eclectic individuals, as well as with organizations.

We established LOHAUS as a space where new ideas could not only be exchanged, but also seen, tested and studied. This allows people to be inspired by a new technology or concept, learn to deeply understand it and then easily apply it to their own home or work lives. At LOHAUS, we surround people with creative and changing art, photography, music and objects. Our support of local artists takes the form of rotating exhibitions that are also exploring new forms of artistic expression and commercialization. We collaborate with the artists to create new ideas, such as our work with Shanghai-based illustrator, author and entrepreneur Ake, as described in the opening chapter about what I call Locanomics – local economic participation.

Like the Bauhaus, we also provide rooms at the LOHAUS for training, coaching, seminars and discussions. Designers attend the same events as entrepreneurs and investors. This is a way for everyone to learn about new ideas while meeting new people and finding new opportunities.



## LOHAUS

Today there is the Institute of Design at Stanford, known as the d.school, and the Amsterdam School of Creative Leadership, known as THNK, leading new education and design methodologies, but in the 1920s the Bauhaus format of learning was revolutionary. It is not an exaggeration to write that it changed the way architecture and design, as well as many of their derivative fields, such as fashion, are taught now. By emphasizing *doing* rather than simply understanding, students today gain practical skills. This allows them to better earn a living from their work. They become practitioners immediately upon beginning studies, rather than theorists while studying and only gaining relevant experience upon graduation. This approach was pioneered nearly one hundred years ago at the Bauhaus School.

This is why creation and interaction are so important to both the LOHAUS building and the lifestyle concept we are promoting now. *Doing* is so much more effective than simply studying. LOHAUS is a social enterprise, which is a company that is for-profit while at the same time being mostly or fully for social impact. Social enterprises are like public benefit corporations in the United States. They are not charities nor are they non-government organizations or non-profit organizations. Social enterprises are for-profit organizations devoted to a social good. Therefore,

LOHAUS must make money while it makes its social impact. Otherwise, the impact is not economically sustainable. This leads us to the third Bauhaus principle that inspires LOHAUS behavior.

### *Commercialization and Industrialization*

At the Bauhaus, a connection was also encouraged between the designer and the industry for which they were designing. The workshop style of learning encouraged students to create and build, rather than simply study, and furthermore to use industry standards that would make the production of the work practical. Thus were favored simple designs that could be produced by the machines of the time.

The German designer Dieter Rams became famous for his minimalist yet functional designs at German technology company Braun. He directed collaborative work with the Ulm School of Design, a school co-founded by a Bauhaus alumnus. These connections and others might have led Rams to continue in the tradition of both schools, pushing new ideas into industrialization while making Braun a design leader. For example, Braun's was the first record player that used a mass-produced transparent plastic cover rather than the solid wood cover that was the norm.

## LOHAUS

When it comes to commercialization, both the LOHAUS building and concept follow the business paradigm of a social enterprise. That is, we invest in and undertake activities that have a social benefit while still being commercially viable. This is one of the main differentiators between what charities and non-profits do, and what we do as a social enterprise. We understand there are many worthy causes in the world, and many people who need help. Many charities are doing good work, but they can't change the reality that they are almost totally dependent on the donors or subsidies that allow them to serve those stakeholders. I believe that many charities are broken, that they have become bloated international organizations that are more concerned with media and public relations than real action.

As introduced above, a social enterprise, on the other hand, delivers a benefit to society, either as a by-product or as the main output of its business model. Many, perhaps most, people are motivated by money. Social enterprise allows them to continue to make money while doing something positive for society. It is a beneficial merger between non-profit social organizations and for-profit enterprises.

Solar energy is a perfect demonstration of one kind of social impact that can also be economical-

ly profitable. Solar energy equipment, such as photovoltaic panels and power inverters, is cheaper than ever before, and in many places around the world, the number of people who have installed them on their own homes' roofs is so large that they are disrupting traditional forms of energy generation. In the United Kingdom alone, there are now 500,000 rooftops of solar energy. Large regions such as the state of Queensland in Australia and places in Hawaii have installed enough solar to make the need for coal-fired thermal generators superfluous at certain times of the day when the sun is strong and overall usage of electricity is low. The problem is, you can't easily turn off thermal plants at a moment's notice, they require hours to shut down and restart, wasting huge amounts of energy in the process.

In China, according to goals set in the five-year plan and elsewhere by the State Council, solar installations, as measured by the amount of gigawatts generated, will need to double by 2017 to meet the target. Solar panels are good for the environment because they do not generate greenhouse gases except at the time they are manufactured, and they can last for decades. There is also a financial benefit for consumers to using solar energy – reducing their monthly power bills. It is a one-time investment to buy and install the equipment, but after that the energy you gener-

## LOHAUS

ate is reducing the amount of money you pay to the power company. At the same time, this clean energy is having a benefit for society by eventually reducing fossil fuel power generation, which will reduce pollution, improving health and life quality for millions of people. In this way, it can be said that solar manufacturers are a kind of social enterprise. The more successful a manufacturer is, the bigger the benefit to society.

How is the benefit actually measured? One could go about measuring the impact in a number of different ways. For example, the amount of clean power generated, or the amount of carbon dioxide emissions offset, or the Return On Investment (ROI). Measurement of impact is important, and here again Bauhaus provides some ideas from more than 90 years ago.

### *Empiricism and Mechanization*

While the Bauhaus emphasized ideas of creativity and simplicity, it also recognized that some rules and standards of architecture and structural engineering were not to be trifled with. The limits of materials and forms needed to be obeyed for a good design to be functional and safe. The idea of rejection of weapons technology that caused human suffering was a foundational element of the school, arising as it did in the environment fol-

Following World War I. During the Great War, bigger machines, bombs and guns caused destruction and loss of life on a scale never before seen. The Bauhaus participants thus examined the true usefulness of technology and its impact on humanity, but they did not reject technology outright, realizing that it could have benefits as well. They recognized that the human artisan was imperfect, while machines could be made to produce identical, standardized items again and again. In their minds, the creativity of the artist was complemented by the potential of the machine to industrialize and commercialize.

Out of this school came innovations such as mechanically opened windows. One of the lecturers of the school, Gerhard Marcks, designed the Sintrax coffee machine, which uses physical and mechanical means, but no electricity, to make delicious coffee. The mechanism has just five major components, glass being the main material. Heated by a Bunsen burner, and brewed using a siphon technique, the Sintrax is still preferred by many coffee aficionados today as one of the purest ways to make coffee.

At LOHAUS, we are not as focused on the devices and innovations – which are within the realm of places known as product incubators, hardware accelerators and Makerspaces – as we are on *how*

## LOHAUS

the devices are used in a sustainable urban environment. We explore how the ideas of sustainability and technology are thought by some to be a contradiction in our modern society. In other words, one school of sustainability claims you must reject technology, live off the grid, use only natural materials, eat only what you can farm or catch, and generally go back to being rusticated humans. I think that kind of LOHAS thinking is broken, and I would like to replace it with concepts of urban sustainability.

I believe that sustainability is the proper use of technology in an urban context, such that the net gains are better than without the technology because of the additional benefits they provide to the user or society in general. For example, by utilizing aquaponic growing methods, which are a combination of man-made fish farms, known as *aqua-culture*, and growing plants in water, known as *hydro-ponics*, the yields of home and urban gardens can be increased, the amount of pollutants removed from the local air can be increased, and the production of protein – the fish – along with vegetables, means better nutrition than would otherwise be possible with traditional outdoor gardening, hydroponics, or aquaculture separately. While the addition of fish food and perhaps growing lights for indoor use make them slightly more resource intensive, the time saved

by the gardeners, or the quality of nutrition for the garden's supporters, exceeds these additional costs. It is net gain.

**WHAT GOT US HERE WON'T GET US WHERE WE NEED TO GO  
NEXT**

It was the dissatisfaction with LOHAS, along with the found knowledge of Bauhaus, that led me to create a unified approach that I believe combines the best aspects of both.

Throughout the remainder of this book, I will introduce seven principles of a Lifestyle of Health and Urban Sustainability, which individuals such as yourself can selectively implement. They are even useful to the operation of a company that is managed under the Triple Bottom Line – people, planet, profit – model conceived by John Elkington, a British sustainability consultant, in 1994.

Chapter one concerns *locanomics*, the word I use to describe living local, thinking global, and supporting those around your community and city first and foremost in order to make both an economically and environmentally sustainable society going forward.

Chapter two is about reclaiming the idea of a healthy lifestyle, without all the marketing hype. I



## LOHAUS

believe everyone needs to define their own healthy lifestyle, but that certain principles can help you decide which is best for you.

In the following chapter, I examine urban sustainability from the perspective of energy. Our cities today are mostly dependent on fossil fuels, especially oil and gas for our vehicles and coal for our electricity. Making them more efficient starts at the individual level, reducing, switching off and eventually generating our own electricity through home solar panels, wind, fuel cells and other technology that deliver local power.

Chapter four takes its cue from one of the Bauhaus principles: to better manage your life, you need to measure it. You will learn how and what to measure so that you can be more sustainable in the city. This chapter draws on principles from the Quantified Self movement, which is about using technology to monitor and manage the vast amounts of data that can now be collected on your health and behaviors. Everything from step-counters to gym equipment that measures and tracks your progress can be included in quantified self. I was an early practitioner of and live by today as a way of having a more productive, enjoyable life.

Chapter five is applying the same principles from measuring your life to measuring, monitoring and managing your home and office using a system I call the Quantified Building. By making your buildings more efficient, you will also increase its utility, its value, and the enjoyment for its occupants and users. You will find that urban sustainability actually has strong financial benefits and even stronger environmental benefits.

Chapter six reminds us all that life in the city is stressful, and our modern global economy has changed the way we live and work. In order to enjoy a healthy, long and happy life in the city, we need to remember to rest, relax and play. The benefits of doing this include higher productivity and creativity, even as you work fewer hours.

Finally, chapter seven returns to the Bauhaus principle of embracing technology. It is a unifying chapter, taking elements from the rest of the book to show how our urban society is going to change, and how we will change along with it.



Join me now as we explore the new paradigm of LOHAUS, a Lifestyle of Health and Urban Sustainability.

# 1

## LOCANOMICS

I am an interested observer of economics, and have studied its principles to some extent. The theme of two books I have written is China's macroeconomic trends. And I am especially focused on the inter-relationship between China, Japan and the greater Pacific Rim, a geographic area in which I have focused both my studies and my life. From Seattle to Nagoya to Shanghai to growing up in Victoria on the west coast of Canada, I've spent more than 40 years in the region. You might imagine I'd be a big proponent of globalization but, on the contrary, I have come more and more to support the idea that the real pillar of a sustainable economy is local community economics – what I call *locanomics*.

That's not to say that I believe globalization needs to end. In fact, I examined globalization in my second book, *China's Economic Supertrends*, and showed that globalization forces are changing direction – now predominantly East to West – and expanding. At the same time, I have worked with several E-Commerce and online media companies and have seen how location no longer matters when anybody can find your website from anywhere in the world. And I have also seen how globalization is changing traditional work and offshoring jobs, restructuring supply chains, and scattering people and families farther apart through migration, study and career opportunities. While each aspect of globalization has positives, they are also changing the nature of our local economies.

## **LOCANOMICS**

With *locanomics*, I am calling for, first, a return to the traditional norm of local community economics and support and, two, an eventual reconciliation between what makes more sense to do locally and what makes sense to do globally, once all externalities are considered.

You may recall from the introduction that an externality is an economics term for something that is present but not actively calculated into the

## LOHAUS

price of a product or service. For example, pollution in the form of CO<sub>2</sub> is not priced into production in many parts of the world, especially the emerging economies. Carbon taxes are controversial. Even more difficult to get people and governments to accept would be the idea that not only should CO<sub>2</sub> emissions be taxed, but the damage they cause from global warming's rising sea level or storm damage from more intense hurricanes or typhoons should be included as well. No mechanism exists to link cause and effect. We cannot pinpoint, with consistency, which pollution causes which outcomes. In places where causation might be clear, such as a chemical spill by a certain factory in a specific place in the river, it still may not be possible for the local community to assess damage, force cleanup and receive compensation. The factory may have significant lobbying power, or high-priced lawyers that the community or local government cannot counter, or the community might be too dissociated or unaware to take action.

The answer is to return to a very local type of community. You need to know your neighbors. You need to patronize their businesses. You need to be active in local community organizations. You should buy local and sell local. You should enjoy their art, music, and writing. Exercise and socialize together. This is locanomics. It would be

familiar to your grandparents or possibly even great-grandparents, but those of you reading this book have likely grown up in the globalized world of McDonalds, WalMart, and Amazon. We need to first go back to local thinking, before we can reconcile which parts of a more global approach really make sense.

*Community business and support*

One of the general principles of a life of health and urban sustainability is that urban communities need to become more connected. Not in the sense of wired and wireless Internet and mobile phones; our cities are already connected in this way, with faster and more numerous connectivity every year. Rather, we need to go back to the way we were once connected in an earlier, more communal way of life.

If you go back far enough in human history, you will find that humans are not solitary animals; we are familial and tribal. Similar to dolphins, lions and gorillas, we found support and better chances for survival by being in a pack or family. Later, we found that living in larger groups allowed our societies to develop agriculture, politics, arts and more that wouldn't be possible if we were focused solely on our own survival. By sharing resources, we were all better off.

## LOHAUS

Today's society in many ways has become a perverted form of the society that our parents and previous generations enjoyed. We now all have our own individual homes and vehicles and devices, and even individual circles of friends and associates spread across the country and around the world. At the same time, some of us are fooled into believing we are closer together than ever because social media like Facebook and China's WeChat messaging service allow us to see in pictures and video of what is happening in others' lives in almost real-time. Similarly we can each broadcast what is happening in our own life. Together, this provides the illusion of mutual proximity. By commenting on each other's updates, we achieve the illusion of dialogue. And the usage of *emoticons* to substitute for the real face-to-face expression of emotions gives us a false sense of connection.

To be sure, there are benefits from these kinds of false proximity, dialogue and connection that our parents didn't have. Yet with each benefit, we lose something as well.

For example, for somebody growing up today, it will be virtually impossible to lose touch with a friend or classmate. That's good, isn't it? Yet it heralds the death at long last of fate and serendipity – the Netizen today may never experience

the joy of a surprise reunion as paths in time cross in some faraway place.

We also enjoy more *friends* than our previous generations ever did. All we have to do now is just add new contacts on our preferred social network. This replaces the once-long-and-arduous task of building relationships with others the old-fashioned way, by meeting them and building common ground in the form of shared experiences, trials and tribulations that are the glue that bonds true relationships together. That's good, isn't it? Instead, we now have experiences that are still *shared* but only in an ethereal with-you-in-spirit kind of way.

Common ground may be easier to find now: just review a person's profile or newsfeed history. Yet in doing so, a natural process of discovery is lost, that spark that used to forge deeper bonds, the "even after all these years, I didn't know *that* about you until now! Wow!" feeling of wonder. If your interlocutor was a convicted ax murderer who had just gotten out of prison, maybe that's a good thing, but what social media gives in the form of rational, logical, provable digital evidence, it also takes away from senses of intuition, judgment and emotion.



## LOHAUS

What does this have to do with LOHAUS? We believe that we need to form more community connections in the real world first, in order to have richer, more compete social bonds. These bonds are necessary for a sustainable urban life because of the familiarity problem. If you know somebody personally, you are more likely to consider their needs as well as your own, and vice versa. If they are strangers, we tend to ignore their feelings because we simply don't know what their feelings are. We assume, often mistakenly, they care about the same things we do.

What this means for LOHAUS, a lifestyle of health and urban sustainability, is practicing a number of locanomics principles and activities that everyone can do to contribute to having better lives for themselves and others. First, we must examine why these new principles are necessary, what problems they solve. These are some of the challenges I seek to solve.

### *Loss of the Sharing Economy*

I remember that, when I was growing up, my father had a toolshed with useful items for taking care of the home. From time to time, he wouldn't have a needed item so he would go to one of our neighbors who had it, borrow it, and return it later. Similarly, other neighbors would come and ask

him for other items. Together, their resources were much bigger than they were individually. Furthermore, the action of sharing prompted good feelings of helping each other out, reciprocal obligations of sorts (“if you borrow this, can I get that?”), and even an exchange of ideas and knowledge. As long as you were asking for a tool, you could get a short explanation of how to use it, or maybe a better idea of how to do something. Offers of assistance were not uncommon.

Something began to change and, by the time I grew up, there was no more communal tool sharing. I and all my friends each had their own sets. At the same time, we all sought ideas and help elsewhere, first from a plethora of home improvement TV shows, then from an ever-larger repository of online information and videos.

Where I bought my tools changed as well. I remember going with my father to the local hardware store, which seemed of giant proportions to my child’s body and mind, but in reality was more of a family-owned business in a big shop with a lumber shed out back. What I noticed happening, though, over time was that stores were getting bigger. First you had large department stores and consolidation of some of the smaller hardware stores, then Walmart took over an even bigger share of the market, and finally many people

## LOHAUS

skipped the stores entirely and just bought online.

Our houses were getting bigger and bigger too, seemingly to store all the stuff we were buying.

At the same time, advertising was telling us that, to be professional, you had to have your own tools. *This* tool was better than *that* tool for your job.

What ended up happening was that we all bought a lot more stuff, and needed much bigger places to store it all, and the once-beneficial sharing relationship we had with neighbors was no longer necessary.

### *Neighbors Become Strangers*

Another big trend of the past several decades was that cities got bigger and people were less often living in houses with connected backyards and visible entries, porches and windows, and now they were living in gated communities, larger properties set further back from the street, with higher fences. In apartment blocks the only thing you could see of your neighbor was their front door. In fact, it has become more and more common to never even meet your neighbors. For years, even. You might ride in the same apartment

elevator from time to time without ever saying hello. Especially common in buildings where most units are rented is the idea that the person you see might never be seen again, so why even bother saying hello.

Of course it is possible to get to know your neighbors anywhere. And there are doubtless lots of friendly neighbors in a big city now. If you wanted to, you could always knock on somebody's door and say hello, or you could talk to people in the elevators, but after enough surprised reactions and unfriendly looks you learn to mind your own business. You could join the community management group, and be drawn into local building politics, including who are the bad neighbors, what are the problems of the management company, and so on. At least this was a kind of neighborly contact. Is there a better way?

### *The Problem of Stuff*

We used to share a lot of things. When you were finished with a book or a movie, you might lend it or give it to a friend. The act of lending and returning created an opportunity for discussion and real sharing of ideas. The replacement of physical books with e-books, and physical VCR tapes and DVDs with downloadable, on-demand programming, has changed all that. Those digital versions

can be shared only in the sense of giving a copy (illegally or not) to your friend. You can send a link to a favored e-book, digital movie or Hulu TV show, to your entire network of hundreds of acquaintances. So much more sharing than before, right? But how many people even asked for that link in the first place? How many of them ask you about it afterwards? The sharing of the physical objects is fundamentally different from the sharing of the electronic media it has become.

This actually creates a new kind of problem for us. Despite a reduction in some physical media like books and videos, the explosion of new technology and global production has resulted in other physical products. This includes Information Age products such as computers, tablets, and mobile phones, but also all the new things that they allow us to discover and purchase via the Internet. Some people call these things *stuff* because all these new objects are not necessities. Rather they are optional items, consumer clutter that is increasingly taking up space. Instead of calling them *things*, some people such as Annie Leonard started calling it *stuff*. Her video *The Story of Stuff* became a viral hit, seen now by millions of people.

Stuff it not a new problem created in the Information Age however. It was accumulating throughout the Industrial Age and has increased

dramatically in the past 30 years. This is not because we have more information and need more places to store it, but because the information itself is telling us to get *more stuff*. Advertising tells us to buy more. Websites help us to find new things we never knew we needed. More breathless product reviews encourage 'got to have it' impulses. And of course our social networks allow us to see what others are buying to an extent never before possible.

There are even websites that endlessly hype new product launches. They might even feature fetishized "unboxings", the videoing of a new tech gadget as it is lovingly released from its packaging. As a result, companies spend more and more on useless packaging. Consumers then save it because it seems so special, believing it is part of the inherent value of the gadget. It may seem as if throwing it away would result in a loss of utility, a cancellation of the warranty, or a decrease in resale value.

The problem is, the stuff, instruction manuals, boxes and all, clutters our lives and mental focus. The stuff forces us to spend time and energy on purchasing, organizing and eventually disposing of it. And, last but not least, the stuff needs a not insignificant amount of resources to manufacture, distribute and sell.

## LOHAUS

This results in high ecological costs. The production of plastics, which has only been around for about a century and a half, continues to increase dramatically year by year. The extraction of metals results in large amounts of pollution. All to produce our stuff.

Yet there is hope. More and more people realize that they have too much stuff. They are starting to get rid of stuff. And they are going back to sharing stuff with others. However, if you don't know what stuff they have, and they don't know what stuff you have, this is hard to do. Services that allow you to publicize what you have, so your friends can see, are becoming common, but are not yet very popular. Instead, people are gathering in informal networks and simply expressing the desire to share or swap with one another the things they don't need all the time. This includes printed books, clothing, expensive items such as digital cameras, and more. We do this at the physical LOHAUS at our swap events.

So this is the first principle of locanomics. You should start sharing with others, and asking to share their stuff. For example, when you have a need for some object, try posting to your social network, "Does anybody have this item?" People are usually more than willing to help. They are al-

so surprised, but usually delighted, that someone will use their stuff.

This principle covers person-to-person transactions in your local community. It is made better by a large local network of friends who are close by, rather than a far-flung collection of connections. But when your local friend network is not large enough to provide what you need, you can turn to the next locanomics principle of local commerce.

### **FROM E-COMMERCE TO C-COMMERCE**

To be clear, LOHAUS does not mean the end of E-commerce, just as it does not mean the end of globalization. I believe that we need to replace e-commerce with C-commerce, community commerce.

One thing that has also been lost in our interconnected, e-commerce-enabled global market, is a connection with local businesses and vendors. Let's be honest, many of those local businesses are consolidated into much larger chain stores, or like small bookstores, they are just gone, and the antique and second-hand bookstores managing to hang on appear as relics of a bygone age.



## LOHAUS

Without overly romanticizing yesteryear, we once had the habit of local purchasing because of necessity or convenience. If you needed something simple, like food or a common household item, you could go to the corner store to get it. If you needed a new book, device, or other object, there was a local store for that. The local stores didn't have the best prices, and they didn't always have the best selection, but they were nearby and fast. You knew the shop owner or staff and got a greeting and conversation along with some advice if you wanted it. By going to my local used bookseller when I was growing up, I was introduced to books by the proprietor with a sentence such as, "If you liked this author, you should check out this book over here."

Today, most people get that advice only in an automated email from Amazon, data-mined from your own purchase history and what "other people bought." It amounts to about the same thing, but some of the spirit of the transaction with the traditional bookseller has been lost.

It's not just books, of course. Now when most people need something, their first reaction is to get it online. They buy it on Amazon or on Taobao, and the item is shipped from far away. Or instead of a local store, they go to a regional shopping mall or, if there is one nearby, a hyper-

market such as Walmart, Carrefour or Lianhua. Sometimes it seems as if the only people buying from the traditional local proprietors are the nearby residents who don't want to be troubled using the Internet or going to a big hypermarket.

### **LOCANOMICS MEANS LOCAL COMMERCE**

Part of being in a community is supporting the community economy. That includes the vendors and service providers who are in the area. This is doubly true if those people not only work in your neighborhood but live in your neighborhood. Why not support the local coffee shop opened by your neighbor rather than the multinational Starbucks, which doesn't care much about you or the community? At the same time, get your bread from a local baker, fresh every morning, instead of at the grocery store where it might be made in the factory. Eat at the local restaurants instead of McDonalds and other fast food outlets.

At LOHAUS, we think c-commerce is especially important if you are in business yourself. In other words, it is important to get to know the businesses in your local area, and work with them. Working with companies that are close to you is easier in some ways because it cuts down on logistics costs, and saves transportation time. You also know the person you are doing business with,

## LOHAUS

meaning that trust is higher, for credit purposes as well as product quality. There's an extra incentive for local proprietors to provide good service to other community businesses because they have a vested interest in the personal relationship as well as the business transaction.

We have experienced many benefits from working with local tradespeople, for example.

### *Home Improvements*

When we needed to improve the insulation of our LOHAUS building to increase comfort and reduce inefficiency from excess air conditioning and heating, we decided to install double-paned windows inside the existing single-pane windows. Manufactured double-pane windows would be installed by a dedicated installation team and be created in a factory far from downtown. The quotation we got from them was about 30,000 RMB (about U.S. \$5,000) for all the windows in the LOHAUS. Pondering this large expense for our social enterprise, one day we were walking down the street when we suddenly noticed a local vendor was making windows in a small workshop. My partner Andrea started talking to him and we found out he was from a small town in the southern Chinese province of Fujian. He had been working in Shanghai for many years, and he could help

us with our project at half the cost of the other company. He was even willing to give us custom windows that would be a better match with the older windows.

This process was not without its problems, as we sometimes had to wait while he dealt with other customers, and there were some quality issues as these windows were not made in a factory with dust controls and automated machinery. These windows were made by hand, on the street, so we noticed that a few of the panes had finger prints and dust *on the inside* of the double-panes. But, being just down the street, he was able to quickly fix the problem. Furthermore, we were more than happy to recommend customers to him, and he was welcome to bring some of his potential customers to our building to see his work. Overall it was a win-win situation for everyone, and we were supporting our local business community.

In some ways, c-commerce is nothing new. In many places there are organizations like Chambers of Commerce whose members support each other. Worldwide Rotary Clubs come from a tradition whereby vocational experts provide services to one another. This is not exactly what we are talking about. Even the Chambers and clubs today have become quite large. When they become too big they are supporting a group of insiders that

## LOHAUS

excludes others. Rather, what we are talking about here is an alternative, or a supplement, to those existing networks. A conscious decision to work with local businesses and build local relationships, literally next door neighbors in some cases. And not because you are each a member of a chamber or a club, but because you live in the same area.

### *Not Fast Food, Fresh Food Fast*

At LOHAUS, we also work with a number of local bakeries and restaurants to provide catering for our events. This gives us the advantage of getting fresh food, fast, where we know the people making it. We can trust their ingredients and processes.

The continued examples of food safety problems in China worry us because the larger a particular food manufacturer or restaurant chain becomes, the more likely it seems to start squeezing profits by adding cheaper materials as filler. In China, this has included cardboard-containing buns where there should have been meat.

Big companies, especially those with many suppliers, might have trouble with quality control. This was the problem of the melamine-containing milk powder scandal which shocked China's con-

sumers, especially parents of small infants. Small suppliers to a larger dairy were adding melamine to increase protein content. Melamine is usually the plastic coating on tables and other cheap furniture, but also tricks the testing equipment into thinking there is more protein. It is unfortunately toxic for human consumption and made thousands of babies ill, several fatally.

The list doesn't stop there -- chicken from Chinese producers has been found to be pumped with excessive antibiotics, and pork has been injected with dirty water to increase its weight.

The label on the package might not even be accurate. Substitute ingredients might mean your beef is actually fox, or the lamb skewer you bought on the street is actually cat or, worse, rat.

Food in restaurants might be cooked in gutter oil. That is, oil that has been reclaimed from the waste grease and not, as some environmentalists might hope, turned into biodiesel, but instead filtered and "cleaned" and then sold back to other restaurants.

It's a wonder people can eat anything at all without fearing for their lives. I certainly have that fear, so another set of locanomics principles relating to food quality and safety is to never eat at fast food restaurants, don't serve manufactured

## LOHAUS

products at home or in your business, and source everything directly from the original producer if possible.

That's why we were delighted to discover Patisserie Alexander, a new bakery that opened near the LOHAUS building in downtown Shanghai. Alexander, a chef who trained in France, prepares fresh pastries, cakes and other baked goods using only top quality pure ingredients. No preservatives or additional packaging needed, we get the items delivered directly from the store on plates, ready to serve customers at their business meetings in the LOHAUS building.

Similarly, much of our other food in the space comes from local suppliers that produce fresh food such as salads and sandwiches, and catering for our events comes from Liberation Kitchen, a nearby cooking school that also adopted a kitten that wandered into LOHAUS one night after an event. Cappuccino, as he is now known, joined Mocha, their first cat. Such kindness simply isn't possible when your supplier is called "International Foods Manufacturing Limited" and is located dozens or even hundreds of miles away.

Local businesses can also work together to help promote one another's businesses, providing coupons and so on. In return, they get a quick re-

sponse, even delivery within minutes. The suppliers that we use at LOHAUS are all local, small businesses started by people who love what they do; we know the owners and have met them. So we trust them, more than we would buying from a conglomerate.

### **THE LIMITS OF LOCANOMICS**

The point of the above discussion is that, wherever you are located, certain things will be locally available, and certain things will not be. Substitutes might be available. But does locanomics mean you should give up coffee if you are living in Canada? It does not. Rather, the third major principle of locanomics is to look for the solution that has the best relative advantage. In other words, a Canadian could buy coffee from a direct trade South American plantation, but perhaps shouldn't buy coffee from Kenya, which is significantly farther away and more expensive from which to ship, both in terms of cost and in terms of greenhouse gas emissions.

At LOHAUS, we endeavor to serve no imported items and try to buy direct from the farmers or cooperatives where possible in every case.

To us, this policy is an extension of our community business model. We buy Longjin tea from near-



## LOHAUS

by Hangzhou, coffee from relatively farther Yun-nan province. Generally, the closer the better, but there are exceptions to the rule.

### *No Preservatives Necessary*

One story stands out for us. This happened shortly after we opened LOHAUS in June 2013.

On a business trip to Weihai, a coastal town in Shandong province, some of us we were lucky to stay at a hotel near the beach. A recent typhoon had brought waves and winds, but the temperature was a balmy 25 degrees Celsius (about 77 Fahrenheit). We went for a walk along a road that followed the coast, and it wasn't long before we saw a shack set up along the road, about a kilometer (six-tenths of a mile) from the hotel. It turns out that we had stumbled upon the temporary living and manufacturing base of some migrant workers from the central province of Anhui. They were selling some suspicious-looking jars of oil at a table stand along the road.

At first this reminded me of how many hobby farms in Canada sell their produce to people driving by. Quality is assured because you know the house where it came from. Some of them don't even have a salesperson, they just have a box where you drop your money. But these were clear-

ly not local residents; their “home” was nothing more than a shanty that had been hammered together out of plywood and tarps, but it had electricity from a portable generator and they appeared to be manufacturing something. Curious, we took a closer look. Industrial chemicals? Had we discovered one of the infamous producers of gutter oil?

Worried some huckster would soon come to pressure us into buying something, we almost walked on but, out of curiosity, I spoke to one of the people and asked them about what they were selling.

It was honey! The golden, amber, and clear liquids turned out to be freshly made honey, some of it with honeycomb inside, some pasteurized, some raw. I had grown up next to a small farm where bees could be found so I knew a little about this, but when we encountered the honey stand on the road, our first reaction, honestly, was, *this must be a trick; this honey must be fake!*

We asked how they produced the honey, was it made from sugar and water, did they make it in that shack there? “No, it’s honey from beehives, of course!” was the answer. “Where?” Andrea asked. As it turned out, right there, not in the shack, but in the woods behind it. These migrant

## LOHAUS

farmers had set up beehives and were literally making honey (and money) by selling directly to people at their roadside stand.

The farmer walked us into the forest and soon we saw many wooden box hives, and we were surrounded by bees, thousands and thousands of honeybees. "Don't be afraid, Andrea. Bees can sense fear..." I said, to cover my own sense of worry. Growing up in small-town Victoria, I've been stung enough times to feel a little afraid, and I'd never been so close to that many hives with no protection whatsoever. *Don't we need bee bonnets? What about that smoke to make the bees go to sleep?* I asked Andrea to translate. The farmer just laughed.

The farmer started pulling out the honeycombs to show us how the honey was being produced. We actually learned more about honey that day, from that small illegal farm behind a temporary shack run by a husband and wife team of migrant workers, than we had in our entire lives. Amazingly, we *still* felt worried about the quality of the honey. "Does *this* honey in *those* jars *really* come from *these* bees?" Andrea asked. This is an indication, we feel, of how dangerously skeptical and cynical our society has become, especially in China where food safety has become a daily concern. We ourselves were "city slickers" – people who knew only

the urban environment and had lost touch with nature. We would often rather buy something that has been produced in a factory hundreds or thousands of kilometers away, is full of chemicals and preservatives, contains wasteful packaging, and was bought in a hypermarket – rather than get something pure and simple from a local supplier.

As it was, we ended up buying several large jars, unlabelled, with no expiry date. Good quality honey, it turns out, never expires. It can last for thousands of years. We wouldn't need it that long, so we brought this honey back with us to Shanghai in our checked luggage. Although we could have gotten the honey from nearby Shanghai, we were already in Weihai and already flying, so it was better than sending it. For the next six months, our most popular non-coffee drink at LO-HAUS was *Shandong Honey Lemon Tea*. And the honey was delicious, the best we have ever had.

This philosophy of natural ingredients, locally sourced, is available to almost everyone. It's a choice that we must make. Of course, we can choose the easy way and buy from big hypermarkets and get our food from KFC, McDonalds or the Chinese chain of *ZhenGongFu* cafeterias, but often local food, better quality food, and usually at even cheaper prices, is often right around the corner. You just have to look. It actually took a

## LOHAUS

trip to Weihai and a meeting with some farmers from Anhui to remind us of that important lesson.

It is not just food and products that can be sourced locally. Services are also available locally. That's why the locanomics policy of "local is better where possible" extends to almost every aspect of the LOHAUS operation, including the people we work with.

### *Local Creativity*

When deciding how to create something with meaning and inspire others into action, the environment you are working and living in is important. In a lifestyle of health and urban sustainability, stuff is a bad thing but materialism in its entirety does not need to be forsaken. Rather, we believe simply that every object and decoration that we bring into our lives should have meaning. As an expression of environmental sustainability, all the objects and permanent decorations in LOHAUS are reused items, many of them left from the previous occupant of the building. In order to inspire people who are in the LOHAUS building, we make an exception to this rule with some items that are regularly changed, modified and updated. This includes the art and front window displays.

Art includes many things, both physical, permanent and concrete, as well as emotional, ephemeral, and abstract. It is books, photographs, paintings, sculptures, dance and other performances and many newer things that merge digital and analog, old and new. But, at its most fundamental, art should inspire deeper reflection and feeling on the ideas it is trying to express.

At LOHAUS we extend our locanomics concept and c-commerce business model to the artists that we work with. It makes more sense to us to support the development of local artists, so we don't feature the work of non-residents. The city we are in has resident artists for us to support. This usually means that we are often working with local Shanghai people who don't yet have international profiles as artists, yet are still passionate about what they do. Some might question why we do this, when the world is full of creativity. Why not get the best and brightest and most interesting, no matter where they come from?

The reason has to do with how much you can collaborate, trust and work closely with a local artist versus somebody who might not even be in the same country. This is similar in concept to the way we work with local bakeries and restaurants, but in this case it is not about speed of delivery or flexibility but more about collaboration.

## LOHAUS

Our art partnerships model has allowed us to work with several artists to not only show their work, but to give them a place to interact with the public that is more than just a gallery. At LOHAUS, our featured art partners have created events where they interact with the public, teaching them about drawing, design or creativity. Of course we have the usual gallery openings and parties where their work is on display, but that not the focus of what we do. Nor is selling their work, which surprises many people. We think that a gallery or agent does a much better job of selling the work of artists, especially to the high-net-worth individuals who like to buy expensive art. We are more than happy to introduce a prospective buyer to the artist directly. So if selling the art is not what we are interested in, what is the benefit of working with the artist in this way?

What we are interested in exploring is the deeper meaning of creation as part of our changing economy. LOHAUS believes that, one day soon, a much greater number of people will make their living from creativity. For reasons outlined elsewhere in the book, the traditional economy of working for a company during a 20-plus-year career is coming to an end. More and more people will switch to part-time work, freelance work, or such a small amount of work that many will think it would be better if they didn't work at all. Of

course, until we solve world hunger and create and endless supply of near-free energy, everyone will have to work at least sometimes. But rather than working for a big company, many will have to make their own work.

One example of this at LOHAUS is how we are trying to create new types of collaboration that will lead to more value for both producer and consumer. So when we decide to change the art on display at LOHAUS, it is not just for a change of appearance. We are actually looking at how we can explore deeper partnerships, including events, commerce, and new creativity.

### *More than Just a Gallery*

The physical LOHAUS is a space that would be suitable for being an art gallery exclusively, but doing so would miss so much of the potential of the physical space. And borrowing again from Bauhaus, a space that was not fully integrated with art rather than being merely decorated by it would be a waste. As such, we always try to host a variety of events to make full use of the space while providing new inspiration to visitors and ideas on urban sustainability. This is a soft sell, we don't bludgeon people with messages about eco-consciousness and behavior change. Rather we try to influence them and provide a space so



## LOHAUS

that when they are ready to learn more and take their own steps, LOHAUS the space, and LOHAUS the life are there to support them rather than vice versa.

For example, for each artist showing work at LOHAUS, we will not only host an opening, we also will do artist salons where the public can meet the artist, discuss their art with them, and learn from them. The fans of the art or artist also have a chance to meet and interact with each other, extending a relationship that might have existed only online in chat forums, or never existed at all. For example, Shanghai illustrator and writer Ake hosted a salon at LOHAUS on how to appreciate and understand illustrated books, which he specializes in. The people who enjoy such works may be fewer than those for other forms of art but they are just as passionate about their interest, which made for a lively discussion.

We also want to teach people how to make their own art. At LOHAUS, one of our members, Lizzy, has hosted several “art jams” which are seminars to learn to paint from a professional instructor, while interacting with and being inspired by others who are learning, and to take home your own creation to put on your wall, all on the same day.

The intersection between traditional art and new technology is especially interesting for a life of health and urban sustainability because of the limits of space, even as technology expands. That's why access to and understanding of the new tools of creation are important for our Bauhaus-inspired principle of utilizing technology. A LOHAUS member, Xiaoxiao, taught the public how to use the newest 3D printing equipment, including larger MakerBot 3D printers and even handheld 3D printing pens to "draw" their own 3D models.

For photography, we worked with National Geographic China photographer Shen Yunyao to create an interactive experience of photography, where people would go floor to floor in the LOHAUS building to see something new, do something new, or learn something new about photography. The theme of the show, Tibet, was expressed through sight, taste, smell, sound and even Tibetan people who attended and interacted with the public. It was a popular event, for one day only, that attracted hundreds of participants.

We've been to many gallery shows elsewhere that are all very similar. There is an air of exclusivity, artiness; people stand and drink wine and eat canapés, and the artist might be seen flitting from media to buyer to gallery owner and their exclu-

sive circle of friends. While this is part of what we also do during the art opening, this model itself is a remnant of the old economy where a small number of big buyers dominated the art world.

Today, through online interaction and events, artists are becoming more social. The sharing economy that we are part of, and that we see being built around us today, is more about interaction with others in your *tribe*. That is, a group of people that share your intense passion. The tribe concept, as popularized by writer Seth Godin, emphasizes that the association with, and deeper understanding of the artist and the art creation process, as well as with each other, is what drives the creation of new economic value. For art in all of its forms, tribes are also about the democratization of art – anybody can be an artist, and we believe, someday in the not too distant future, everyone will be.

### *Art Commerce and Artist Incubation*

Being part of the new economy of art also means ensuring sustainability. In this case, we don't mean environmental sustainability, we mean commercial sustainability. The difference between a hobbyist and a professional is often described as being paid for the work you do. If you are a hobbyist, you usually don't get paid. If you are a pro-

fessional, you always get paid. In today's reality, both are no longer strictly true. Hobbyists are increasingly paid through new channels, such as self-published e-books, and more and more professionals work – at least part of their time – for free in order to build a platform and to feed their tribe, so to speak.

For the moment, LOHAUS is mostly concerned with helping new artists to develop the channel approach to commerce, to help them to generate new revenues, and to make their work more commercially sustainable. LOHAS is also concerned with the question of how hobbyists are going to make supplemental incomes from what they are passionate about. We have already discovered a number of important things.

First, events should not be free. While it is common for an art gallery opening to be free to invited attendees in the hope that they will buy some of the art, viewing the art in general should be part of a larger, paid event of some kind. Art museums are different from galleries.

Second, if paying an event admission just to hear a speech or presentation is thought too expensive by consumers, then give the attendees more value instead of lowering the admission. Offer a nice cup of coffee, some appetizers or desserts. This is

## LOHAUS

where LOHAUS's community business partnerships support us. We don't just provide a basic cup of coffee or tea, we can provide a delicious Yunnan cappuccino and gourmet cream puffs from a French-trained pastry chef to make the experience pleasurable for all the senses. Authors can provide a copy of their book, or attendees can create something and bring it home. The key is to create value for the attendee that doesn't cost a lot to provide but is of high value to the recipient.

Third, the traditional model of art sales is another area that is changing. At one point, art was merely created and sold. Today it is increasingly customized for the buyer. Our friend Ake creates his art through a combination of hand-drawing and computer-generated images to create digital illustrations that are popular with his readers. What he does differently from most artists is that he creates his art on demand for customers. If somebody would like an attractive color poster for their wall, they tell Ake which one of his many works they would like, which size they want, even sometimes what kind of material to print on, and Ake provides the customized work, signed or unsigned, in limited editions or unlimited quantities. He is one of the smartest new economy artisans that we know working today.

He of course has a website to sell directly as well, but at LOHAUS, we displayed his art, people saw it, and then we facilitated the printing and delivery through Ake. We were also happy in many instances to directly introduce the customer to Ake and he handled the entire process. In others, we helped by being the delivery and pickup point.

Leveraging art into other mediums is also a growing business trend that we are participating in at LOHAUS. For example, Ake also produces environmentally sustainable canvas bags printed with his art, which we sell at LOHAUS. LOHAUS benefits in other ways, for example by having interesting things on the wall to inspire our customers, interesting items to offer as lucky draw prizes, and of course we can get some commissions from facilitating the sales. It's a win-win partnership.

## **OTHER COOPERATIVE PARTNERSHIPS**

Relationships are the foundation of business growth and success in the new economy model of urban sustainability. At LOHAUS, we work with a number of people with unique skills and networks. Each of them is a "Company of One" in as much as they are the prime movers of their organizations, or they were the founders, or both. That does not mean their resources are that of a single person or that they have no employees. Far from

## LOHAUS

it. They are connected individuals in the new economy that bring their individual skills, their staff and collaborators, and their entire social network. Here are just a few of the multifaceted organizations led by a talented individuals that are part of our c-commerce network.

### *Miss Earth China Beauty Pageant*

As one of the world's "big three" beauty competitions, Miss Earth is a global organization that hosts a series of regional, national and international pageants to select a global winner. Unlike the other two organizations Miss World and Miss Universe, Miss Earth is the only one that places sustainability as a key objective of its mission. While celebrating the talents and the beauty of the contestants is important, what those contestants actually do *for* the Earth specifically is also taken into consideration.

Miss Earth China is a nationwide competition held to find the most sustainable, most charismatic and of course most beautiful Chinese contestants to compete for the chance to go to the world finals for the possibility of being crowned Miss Earth.

Cooperation between LOHAUS and the Miss Earth China pageant all started with the director of the

Miss Earth China organization, Mike Rosenthal, simply attending a LOHAUS event and getting to know us. From this the relationship developed into an important strategic alliance that continues today.

For LOHAUS, working with Miss Earth China has been meaningful in a number of ways. As a social enterprise, LOHAUS has provided project activities for Miss Earth China contestants to participate in, to demonstrate their commitment to sustainable activities. Some might say beauty pageants are an out-of-date, sexist way to attract attention to important global issues, but the Miss Earth China competition tries to be different from their traditional beauty pageant competitors by getting involved in the causes and helping them to attract media attention.

For example, for our LED Light Bulb Initiative, which distributes LED bulbs, recycles old bulbs, and educates members of the public who come to LOHAUS to learn about LED light bulbs, Miss Earth China contestants were on hand for major events. For LOHAUS, this helped us to meet and interact with more people in a more compelling way. For Miss Earth China, it was a way for their contestants to gain visibility to the public and media who saw them as some of the faces of the LED campaign. Both organizations benefitted from the



## LOHAUS

publicity from the event video and photos, which led to thousands more participating in the campaign.

Cross-promotional activities are also frequently utilized by both organizations. LOHAUS is present at some Miss Earth China events, and Miss Earth China contestants are present at some LOHAUS events, creating a more complete event experience for the participants and a better media story.

### *Green Initiatives*

Green Initiatives was introduced to me when I was invited to speak at the group's monthly networking event, called Green Drinks China (GDC). I talked about the Sustainability Supertrend from my second book, *China's Economic Supertrends*. It was actually on one fateful trip to a small area a couple of hours from Shanghai, known as Anji, that the seed of LOHAUS was formed.

A May 2012 trip to Anji was arranged by the GDC team, which was then mainly comprised of two people -- Nitin Dani and Irving Steel. Anji County is about two hours' drive from Shanghai, in Zhejiang province. It is famous in China for its bamboo forests, and it is famous abroad from a number of martial arts films, most notably Ang Lee's *Crouching Tiger, Hidden Dragon*, having had

scenes filmed there. Where the bamboo is located, Anji is an idyllic, rural atmosphere of farms, creeks, and winding roads.

The bamboo on the hills and mountains form a rich green backdrop year round, while also providing sustenance for the people, both gastronomically and economically. The edible bamboo shoots form a key part of local cuisine as well as being sold at a premium in more distant markets, and the bamboo stalks, small and large, are made into everything from bamboo fans to clothing to Anji's biggest industries by value, furniture and flooring.

Anji has also become something of an eco-city, with the government and people recognizing the importance of nature to their livelihoods. The GDC group was invited to visit an eco-hotel, a collection of about two dozen cabins in the middle of bamboo groves on a hillside. On the same weekend, several GDC members would be presenting their key sustainability initiatives or practices, including aquaponics, air quality measurement, and urban development. Along the way we'd hike together, eat together, and get to know one another.

I was invited to speak at the opening presentation where representatives of the Anji government

## LOHAUS

would speak as well, the theme being eco-conscious economic development. I focused on one trend I had covered in my first book in 2008, the growing number of Chinese people who were traveling more and who were seeking new experiences different from those of their city lives.

In fact, going back to nature has been a trend abroad for decades, and the concept of ecotourism is not new, but as early as 2008 my co-author and I saw the opportunity for this business in China as Chinese consumers became more affluent and their cities became more polluted. They would of course want to get out of the city from time to time, and they might like to travel to a natural, clean air environment.

During that weekend, we all saw a number of seminars presented by GDC attendees and collaborators.

One presentation on aquaponics was delivered by Lynn King, who heads her own food security social enterprise called Fish Garden. The concept of aquaponics, fish and vegetables growing together symbiotically, today also forms a part of LOHAUS's urban sustainability strategy.

The weekend's presentation on indoor pollution measurement is now part of LOHAUS's air quality

initiatives as well as part of our Quantified Building strategies, described further on in the book.

It speaks to the power of what getting away from the city and going to a natural and relaxing place can do to help to clear your mind and get you to think in new directions. When we returned to Shanghai, my own life began to transform and go in new directions, and ultimately led to the founding of LOHAUS a year later.

These early influences of GDC were important in inspiring me to create the principles of a life of health and urban sustainability, and GDC's parent organization, Green Initiatives, and its current principal Nitin Dani, have also contributed to the operation of the physical LOHAUS building as well. We work with Green Initiatives to host events together, and generally support each other where possible.

For example, we have co-produced two events on the theme of sustainable finance. This topic is an area both organizations and founders are passionate about, and ties in with the theme of my discussion group around the state of China's economic development. Both sustainable finance events the sustainable finance series were well attended and brought together two groups of diverse people.

## LOHAUS

Green Initiatives and LOHAUS also partner in promotion, helping each other with occasional event announcements, social media sharing and other forms of cross-promotion to enable both of our organizations to grow and prosper.

### *L'otel*

As an event venue, LOHAUS has some limitations. It is a relatively small building of just 300 square meters (about 3,200 square feet). It can't be compared with hotels and other larger venues in terms of size. While we can host meetings, presentations, and shared office services, larger conferences or meetings of 100 people or more are difficult.

The answer for us was to work with a hotel partner. But which hotel? Shanghai has dozens of high quality hotels, but we found that few of those hotels match our commitment to sustainability. Little reminders on your pillow and in the bathroom to conserve water by not asking for bedsheets and towels to be washed every day on multi-night stays aren't enough, especially when the hotels offer thousands of the tiny inefficient shampoo and conditioner bottles and other throw-away items. We also had a problem with how the larger international hotels and their restaurants sourced meats and seafood flown in from all over the

world, not to mention that their guests usually fly in as well. In general, hotels aren't very sustainable in spite of their best efforts.

For us, the choice of a local hotel partner became easy when we found Kenneth Yeh, introduced through one of our social enterprise friends. Kenny, as he likes to be called, is manager of L'otel, a Shanghai-based economy hotel that endeavors to do everything it can to be sustainable.

L'otel was one of the first hotels in the world to switch to all LED lighting, for example. LED is the most energy efficient type of lighting. You can see major hotels in any city today that are still using less efficient compact fluorescent, halogen and even traditional incandescent mood lighting. Not at L'otel. Also, its rooms are smaller than a typical hotel's, reflecting an economical use of space. Their food is locally sourced, and food waste is composted in their own garden. The hotel has so many eco-features we can't list them all here, but two things stand out.

First, Kenny and L'otel are strong supporters of social enterprises. The hotel hosts the social enterprise mentioned above, Fish Garden, run by Lynn King, who originally inspired us to learn more about aquaponics during the GDC Anji tour. The fish are in ponds, and the gardens produce

## LOHAUS

plants and vegetables which can be used at L'otel. Yeh also sources from social enterprises, such as coffee bean supplier Cambio Coffee, which practices direct trade – buying beans directly from the farmers who are growing the coffee.

Second, Yeh creates community events at L'otel that help to support the development of the local economy, which is something we at LOHAUS strongly support. For example, every year, L'otel hosts its community carnival, which sees thousands of people visiting for performances from local schools and artists, for education from partners such as Fish Garden, and for goods and services from social enterprises like Cambio and dozens of others.

L'otel and LOHAUS work together first by being listed as cooperative partners in each other's respective businesses. We refer clients to each other, for example. When a client is using our LOHAUS for a small meeting, event or team-building activity, we can offer accommodations at L'otel. We also try to create events and initiatives that will help our respective interests. When people ask about our demonstration aquaponics units in the window, we suggest they go check out the much bigger ones from Fish Garden at L'otel if they would like to know more.

### *Other Collaborators*

LOHAUS has formal strategic partnership agreements, either written or verbal, with its partners but it also has dozens of collaborators that it works with on a project basis or smaller scale, without formal agreements. Basically at heart our LOHAUS partnership approach is to try to help out others to develop their business and hope that they will help us in return. Or we see the people and organizations who have tried to help us, and we do what we can for them in return.

From our artist friends who work with us on a single show and then continue to collaborate with us on projects afterwards, to our co-working members who use the shared desk space for their coaching, training, design and other work, introducing new clients in the process, we help host and promote their events at LOHAUS. We also ask them to be guest speakers at our events, feature them in our works including, you might have noticed, this chapter and photos throughout the book, invite their participation in our activities and initiatives, and more.



Locanomics as I have described it here is about first and foremost thinking locally. It is not possible to do everything locally or get everything you



## LOHAUS

want to eat at a farmers market. But, unlike traditional proponents of eco-living, we don't get hung up on a purely local lifestyle. Globalization is here to stay, but its importance may be decreasing as many industries shutting down offshore factories in order to return to domestic manufacturing, a process sometimes called reshoring. In our own communities, it is time to return to local community commerce, c-commerce, for what we can, e-commerce for what we cannot, and global commerce only for the things that we must have.

Whether you are an individual or an organization, locanomics also makes good business sense by working with partners who are closer by and easier to work with, faster for deliveries, and sometimes, though not always, even cheaper than something shipped from far away. It also means exploring new modes of commerce with them, and new channels of promotion, such as events that reinforce the concept of tribe and interconnection between people in local communities.

In the next chapter, we shift gears from commerce and collaboration to health and wellness, two prerequisites to a happier urban life for everyone.



## 2

### BETTER BREATHING, BETTER LIFE

**W**e are increasingly living in cities, urbanizing around the world, according to the latest United Nations statistics. Driven by emerging economies, urbanization rates are on the rise and are predicted to increase steadily.

Cities were supposed to make life better, but it appears as if the quality of life is actually going down. There is overcrowding, lower air quality caused by auto pollution, high real estate prices that create slums surrounding pockets of affluence, and a lack of good-paying jobs.

One of the fundamental characteristics of the quality of life that has been getting worse in cities, in China especially, is air quality. This chapter focuses on some of the solutions that you can implement for better air.



My first impression of poor air quality in China came upon arrival in 2003. At Pudong International Airport, I noticed as soon as I stepped off the plane that the skies were somewhat gray and dismal. What looked like a rainy cloud cover day to a Pacific Northwest native like myself actually turned out to be smoggy, 35 Celsius (95 Fahrenheit), hot and humid weather. It didn't rain for my first week or more, and I didn't see a blue sky again for many months. There were relatively clear days, but the haze in the air turned the sky a light gray at best.

For the next decade, I didn't see many blue sky days except when I left China and was reminded of how nice the weather could be elsewhere. Although some parts of China, such as the island province of Hainan with its tourist beaches, could actually be quite nice at times, I got used to smog as a part of daily life. And Shanghai's air was certainly better than Beijing's, which was regularly a darker shade of gray than almost any other city I visited. So I counted myself lucky and thought little about pollution until nearly a decade later.

It was at that time the city of Shanghai hosted the 2010 World Exposition. Held annually, but with every fifth year customarily reserved for a

## LOHAUS

major international destination, the Expo was a big deal for China as a nation and Shanghai as the representative city. Being selected demonstrated to the Chinese people that their country had emerged on the world stage. This in turn would show the world the rising power of China, its industrial might and its drawing power as a destination for everything from tourists to foreign investment.

The motto of the 2010 Expo was *Better City, Better Life*. This motto was meant to convey China's commitment to quality, not just quantity, of urbanization. There was, for six months, an amazing showcase of some of China's best clean technology in the pavilions, but the post-Expo effects haven't been as great. Precious little of the eco-construction practices have been continued. Most of the exhibits were dismantled. Air quality seems to have gotten worse.

The legacy of the Shanghai 2010 Expo is a world-class metropolitan transportation infrastructure and that, for a short time in 2010, the city's residents and visitors enjoyed about six months of clean air as nearby factories were shut down and power generation was curbed. And perhaps for me, and this book, with some of my work taking place at the Expo, I was inspired to start thinking

more about China's role in global environmental sustainability.

## **A TALE OF TWO CHINESE CITIES**

In Shanghai, where I have now lived for more than a decade, poor air quality comes from a combination of factors. It is a result of how the power is generated – primarily by burning fossil fuels – and emissions from the factories that surround Shanghai as part of the Yangtze River Delta. This region, which has approximately three times the population of California in one quarter of the land area, is one of the most densely populated places on Earth. Its more than 140 million inhabitants, about one tenth of China's overall population, generate nearly twenty percent of the country's total GDP. That's a lot of electricity and factories in a relatively small area. As well, Shanghai's increasing GDP per capita and affluence of its people have led to an increasing number of vehicles on the roads, but this is also true of the Delta's 22 cities, all of which have experienced blossoming individual wealth. China overall is putting more than ten millions cars on the road each year.

During the 2008 Beijing Olympics, pollution controls -- including relocation of factories, curtailing their production and emissions, and limiting the number of cars being driven each day -- all had a

positive effect on pollution levels. But as soon as the Olympics were over, pollution returned, and was even worse than before.

While air quality conditions in China's major cities are somewhat unique to China, this does not mean its challenges can be ignored elsewhere. As we now know from global atmospheric studies of everything from the ozone layer to average temperatures to quantities of various pollutants, air problems are everyone's problems.

China's pollution is blown not only next door to Japan and South Korea, but as far afield as the United States and Europe. It is the world's largest emitter of greenhouse gases. This is why China and its cities must be an important part of the global debate on what, exactly, urban life should be. China's proportionately large population and economy means that what happens in China could conceivably be extended to other parts of the world that seek to emulate or compete with China. Thus, simply having a better quality of life elsewhere does not mean those cities that are already nice to live in should rest on their laurels and ignore the problems of other cities. Rather, they should be sharing best practices and trying to lend a helping hand.

At LOHAUS, we are coming at the challenge from the opposite direction. We are already in one of China's biggest cities, Shanghai, where we are trying to, first, identify the biggest challenges this city faces and, second, find workable solutions to the challenges that fit Shanghai's unique characteristics. We are being inspired by best practices from all around the world, while not overlooking ideas from within China, from the macroeconomic trends down to the individual level.

### **A TALE OF TWO COUNTRIES**

In some countries, such as the Netherlands, where I wrote part of this book, there are more bicycles than people. Its capital, Amsterdam, has more electric vehicles on the roads than all of China did in 2014. How can one bicycle-loving country, Holland, be successfully turning to clean transportation, while another country, China, formerly having one of the cleanest transportation systems in the world by dint of its having *only* bicycles and practically no cars, become nearly the exact opposite?

The answer, in part, is lifestyle and image. In China cars are now revered as the new status symbols of affluence while bicycles are derided by its youth, who say they would rather cry in a BMW than laugh on a bicycle. Meanwhile, in the Nether-



## LOHAUS

lands, many people I spoke to emphasized that their decision to use a cleaner transportation method was also a choice for lifestyle and image. In this case, they wanted a sustainable lifestyle and to make a positive environmental impact.

That difference of perception is where both the problem and the opportunities can be found. So, first we must understand some of the greatest challenges that affect us all when we are trying to make better urban sustainability choices, whether in China or elsewhere. Second, the question is how to change behavior in a way that is seen as a positive for sustainability. It is about making a choice that we would like to embrace, rather than a choice that is ridiculed. Until we can make sustainable choices attractive, few will be willing to adopt them.

### *The China Syndrome*

I would like to look at China's challenges in air quality in particular, because, first, the LOHAUS building and therefore much of its focus is in China. Second, LOHAUS is in a city, Shanghai, which has in the past several years actually seen its pollution levels *increase* with affluence. In other words, as GDP per capita has increased, pollution levels have gotten worse. This goes somewhat against one piece of conventional economic wis-

dom, which holds that as people grow richer they demand a better environment for themselves and for their children.

It might be said that Shanghai's people desire a better environment, and the city's government is certainly making some efforts to improve it, but expansion of the city's economy has been so rapid that environmental conditions appear to have gotten worse. If the conventional wisdom were true, you might expect people to move away, seeking a better quality of life elsewhere. Certainly some do, but even more people are arriving in the city, looking for opportunities. So the city's population continues to expand, by several million between the 2001 and 2011 censuses.

This is one of the contradictions that can be found in few other places today. By living in a large Chinese city such as Shanghai, and choosing to be here regardless of whether they are Chinese or non-Chinese, people are willingly endangering their health for the sake of economic opportunity.

The second reason I think it is important to focus on China as the front line of the war on air pollution, is that I have seen first-hand how China has become the world leader in virtually every type of clean energy, both in term of manufacturing the equipment and, increasingly, in installing and ac-

tually using it. That's why the global condemnation against China's pollution is somewhat surprising considering it is doing so much to combat pollution. Clearly China is not giving up without a fight, but it is losing most of the battles thus far as the world continues to demand cheap manufactured products. Meanwhile, countries such as the United States continue to enact tariffs on, of all things, solar panels, keeping the prices up and the adoption rates down in the United States, the world's *second* biggest polluter after China. It can thus be said China has few allies in the war on pollution.

One might argue that the reason for the tariffs is so that U.S. manufacturers can compete on a level playing field with China's manufacturers, but the tariffs seem punitive in nature, far exceeding what is needed for the U.S.-owned and foreign-owned companies operating in the solar sector in the U.S, should need. The original complaint against cheap Chinese solar panels was, in fact, made by a German-owned company with a small subsidiary in Oregon. Furthermore, the oil and gas lobbies and utilities in general seem to be supporting clean energy, using lobbying organizations and think tanks to create reports against issues like net metering, which is the regulation that consumers be paid the same amount for the electricity that they buy as for what they sell from

their own rooftop distributed solar installations, for example. These think tanks are often supported by companies like Koch Industries, which has strong interests in maintaining a fossil-fuel status quo.

So, for now, I'd like to focus on the need for better urban air quality and my own efforts and those of LOHAUS to improve it, starting with what we do in Shanghai and what we hope that all of you will do as individuals and businesses.



With 16 of the world's 20 most polluted cities being found in mainland China, according to World Bank data, China obviously has a big problem with pollution.

Part of the problem is how it gets its electricity in the first place. China's electricity generation comes from about 80% coal, 10% oil, and the rest from non-CO2-emitting sources such as hydroelectric, nuclear and a small amount of wind and solar. Small, that is, relative to China's overall energy demand. As we shall see later, its efforts in the area of clean energy are not insignificant at all when compared with those of other countries.

The second major challenge is that economic growth in China is still continuing at seven per-

cent a year or more. This means that, very simply speaking, seven percent more energy is required each year. That is, unless efficiency increases dramatically, more electricity will still be needed as economic growth continues. Given that China has pledged to maintain 7.5 percent growth as part of its national five-year plan, this situation is expected to continue. Nor can the rate of construction of clean power keep up with the speed of economic growth. This means more coal must be burned. Barring strict laws requiring carbon sequestration which, to be fair, no country is doing globally beyond pilot projects, the problem of pollution from burning fossil fuels is going to get much worse for China, and the world.

Another reason China's urban air quality is declining is that there are more and more cars on the road, nationally and especially in the large urban centers. China is adding new vehicles at the rate of roughly 20 million per year. That's about 13 million automobiles and another 7 million vehicles including buses, trucks and specialty vehicles. What is alarming is that China still has far fewer vehicles per person than many other economies. Such growth potential excites the automotive manufacturers, but should scare everyone else -- especially if China continues to add about that many new vehicles every year for the next ten to twenty years of expected economic growth.

And although newer, more efficient combustion engines and catalytic converters help reduce pollution, China still uses tens of millions of older vehicles that run on leaded gasoline and diesel.

While China is investing heavily in electric vehicle technologies as part of its national economic development targets, electric cars are at present the merest fraction of total vehicle sales. One of China's domestic automobile manufacturers, BYD, sold less than two dozen vehicles to the public in the first year of sales of its all-electric vehicle, the E6. But when it comes to electric vehicles, the news is not all bad. BYD has a new model in cooperation with Daimler Chrysler, and almost every manufacturer with a new electric vehicle coming to market is looking at China. One area in which more progress has been made is in updating its transportation fleets. For example, when I arrived in 2003, city buses in downtown Shanghai would spew black smoke constantly as they followed their routes. They have been replaced with, in many cases, electric battery and fuel cell models. The dirtiest buses were simply taken out of service, or sold to other, more remote cities.

Finally, and unfortunately, it is important to remember that any burning of fossil fuels creates CO<sub>2</sub>. Since many of those clean energy vehicles still draw their power from a grid that is 90% fos-

sil fuels, they are still responsible for a fair amount of CO<sub>2</sub> emissions, albeit indirectly and perhaps further from the place in which the vehicles are driven. That's why electric vehicles, despite this tie to fossil fuels, are still better for the environment overall.

Given the above, the best strategy an individual has of improving outdoor air quality is simply reducing consumption and use of electricity. This can best be done at the home or office, where our efforts are magnified across all of the people who share that building with us. This is in fact the main theme in the chapter on holistic buildings. For this chapter, let's talk first about some of the things you can do as an individual to improve your personal air quality.

### **BETTER AIR?**

The air you breathe is the fundamental requirement of life. You may survive more than a month without food, more than a week without water, but without air, oxygen with nitrogen and other gases, you will only survive a matter of minutes. But is some air better than other air?

I take the definition of good air as meaning *natural* air. Natural in the sense of what air would be like in the absence of artificial human activity. In

other words, air without *additional* CO<sub>2</sub> and other pollutants from burning vast quantities of coal to power our cities, or from burning gasoline to fuel our cars.

That is, there was and always have been quantities of all pollutants, as we define them today, in the air. At times in the distant past when there was no human-enabled fossil fuel burning, measurements of CO<sub>2</sub> and sulfur dioxide (SO<sub>2</sub>) in parts per million were still found in the air, but were from natural phenomenon such as forest fires caused by lightning, or volcanic eruptions spewing sulfur dioxide into the upper atmosphere. When human activity started to include burning of biomass, covering everything from recent clearing rainforests in Indonesia for growth of monoculture crops such as oil palm trees, to the traditional disposal of farm wastes such as residues from sugar cane, or rice husks, which are typically burned, releasing much or all of the CO<sub>2</sub> they have stored. Those crops have all increased in terms of volume as global population increases. The really big addition of pollution started to occur during and after the industrial revolution, when our use of fossil fuels for energy expanded exponentially.

The planet, however, has mechanisms for cleaning the air of such pollutants and returning air quality



## LOHAUS

to an equilibrium that allowed life as we know it to evolve and flourish. For example, for SO<sub>2</sub> and other particulate matter in the atmosphere, the mechanism is precipitation. Mixing with water and other molecules high in the atmosphere, SO<sub>2</sub> eventually becomes liquid sulphuric acid, which creates rain with higher acidity, commonly known as acid rain.

When such acid rain is mild and infrequent, the planet effectively cleans its atmosphere of the particulates, and the land and water on which the acid rain falls is able to absorb and buffer it. The world's ecosystem remains in balance. However, when increasing levels of modern human activity are factored in, higher acidity eventually overwhelms the planet's ability to rebalance, resulting in significant damage to plant life and groundwater quality.

When it comes to other air pollutants, many would consider carbon dioxide to be a pollutant. However, CO<sub>2</sub>, like SO<sub>2</sub> and other chemicals, is actually present in the air naturally as well, and has always been. It is just that levels have been increasing in recent decades as levels of human electricity generation and manufacturing increased. Scientists world-wide are near unanimous that higher CO<sub>2</sub> levels both are the result of human activity burning fossil fuels and biomass,

and are the cause of increasing average temperatures through the so-called greenhouse effect. This cause-effect relationship has also come to be known as climate change, and CO<sub>2</sub> is public enemy number one.

Treating CO<sub>2</sub> as a pollutant, however, is a luxury of the developed world. With the exception of developing countries such as Mauritius, which is slowly being inundated by rising tides, most emerging economies take the position that it is their right to develop, regardless of how they get their energy. The emerging economies are usually busy enough worrying about cancer-causing PM 2.5 particulate matter – the smallest particles of pollution that than cross the alveoli in our lungs and enter the bloodstream – or larger PM<sub>10</sub> pollutants, and even toxic chemicals such as benzene, in the air and water from poor regulation of manufacturing. For emerging market consumers then, CO<sub>2</sub> is an afterthought, if they think about it at all.

That said, China, its sea-level coastal cities that are home to cities of ten million or more, including Shanghai, Tianjin, and Shenzhen, cannot afford to ignore the risk of rising sea levels. Thus China is beginning to take action on its own terms.

## LOHAUS

What this all comes down to is, as an individual, you have very little control over outdoor air quality. And in fact, in order to avoid the poor outdoor air with its varying levels of pollution, you only have a couple of choices.

For example, you could not go outdoors at all. You could only go outdoors on days when pollution levels are low. You could, as many Chinese urban residents do, wear a mask when going outdoors. You might take more drastic action, such as moving away from a place with poor air quality. These are all strategies that are viable, if not exactly optimal. Until the bigger issues of societal air pollution can be tackled with coordinated global action to curb emissions, as well as by using more clean energy and electric cars, they are what we've got at the moment.

### *Better Indoor Air*

Fortunately, for indoor air quality, the problem is a little easier to manage -- beyond keeping your doors and windows closed, hermetically, if possible. Airtight windows and doors are actually very energy efficient, but the problem is that ventilation is still required. For fresh air from the outdoors, the primary strategies are filtration, both artificial and natural, as well as keeping toxins out of your indoor environment in the first place.

First, when it comes to artificial filtration, start with using an air conditioner to partially filter the air that comes into your building. The filters on air conditioners are not especially good but they will filter out some of the biggest particulate matter and cut down on dust in the home. This is a great start, but many people try to economize, thinking that keeping the air conditioner off and the windows open will be better for electricity usage. While true, that may only save some money today, possibly at a greater cost tomorrow to your health. Getting a top-rated energy-efficient air conditioner that has a higher quality filter, and frequently changing or cleaning the filter to keep efficiency up, are helpful energy-mitigating strategies against this worry.

The second level of indoor air filtration that everyone should be using is a stand-alone air filtration device. Indoor air filters can be expensive, but with the alternative being to sacrifice your health, it seems better to spend money on some filters now than get much sicker later. Thinking of you, your children, your pets, and visitors to your home, in whichever order you think is most important, might allow you to justify the high cost of an air filter and buying the replacement filters when needed.

## LOHAUS

Replacement filters are like inkjet print cartridges – a profit center for the air filter manufacturers and more expensive than they are probably worth. That’s why there are now so-called peer-to-peer-designed and open source air filters, whereby you purchase parts online and follow a simple construction diagram to build it yourself. The simplest design I’ve seen uses a high-powered fan with a HEPA (high-efficiency particulate air) filter bought separately and attached to the front of the fan with a simple belt attachment. When turned on, air is sucked through the filter. It might not remove as many of the pollutants or be perfectly sealed but, according to simple research done by do-it-yourselfers posted online, these homemade air filtration devices can remove more than 90% of particulate matter, versus 99% or higher for the professional models. For a bit less efficiency, they are far cheaper than stand-alone air filters with proprietary replacement cartridges.

A third strategy, and this comes under the category of natural filtration, is simple houseplants. Whether placed indoors as stand-alone pots or as part of an aquaponics system, as described elsewhere in this book, plants are an important part of any indoor filtration system.

In the 1960s, when manned space exploration started, research was begun to understand the re-

lationship between atmosphere quality and the type of plants that grow. In the 1970s, the work was extended to understand air quality on Skylab, with NASA researchers identifying more than one hundred volatile organic compounds (VOCs) that were present on the space station. VOCs are basically chemicals that have a low boiling point and therefore easily evaporate into the air. VOCs include both relatively benign compounds such as scents from plants, and hazardous chemicals such as benzene. An excessive amount of VOCs in indoor air, such as when paints, solvents and strong cleansers are used, can lead to the building occupants feeling light-headed or ill, a condition known as *sick building syndrome*. The NASA research found that certain plants removed specific toxins from the air, that some plants were more efficient than others at doing so, and other useful data. Today we can benefit from this research by picking some commonly available plants that will increase our air quality at home.

There are many other benefits to plants in our buildings. Some plants, of course, can be eaten. Plants' rich, dark green leaves add atmosphere to a room, literally and figuratively. Rooftop and sidewall plants can keep a building cooler. The only reason not to have plants indoors would possibly be because of allergies or worry about insects. Nevertheless, both of these things can be

## LOHAUS

controlled by the choice of plants and how you care for them, so at LOHAUS, we have always had a lot of plants growing inside and outside, including edible plants. They are an invaluable part of our healthy local ecosystem.

### *Avoiding Toxic Indoor Air*

Cleaning the air can be considered a reactive strategy. That is, you are reacting to the unhealthy air by cleaning it with air filters and plants. A slightly more proactive strategy can be to avoid toxic pollutants in the first place by not bringing them into your building.

As a general rule, using healthier materials means using organic materials made from wood, bamboo, stone and metals, and wearing fibers such as cotton, while avoiding materials with plastics and chemical fibers.

One of the reasons for choosing natural materials is that they may use fewer chemicals in their production processes. That is not to say they are chemical free, however. The VOCs which are released into the indoor air from flatpack furniture, those assemble-it-yourself bookshelves and the like those found at IKEA, for example, or that come from lower quality paints, solvents and glues, can be dangerous in large concentrations.

Another way toxic chemicals get into our buildings is when people smoke tobacco, whether as cigarettes or cigars. One of the most controversial campaigns we undertook at LOHAUS is the promotion of e-cigarettes, which are a type of electronic device that vaporizes a nicotine-containing liquid for inhalation.

*Why e-cigarettes are necessary*

First, let me clarify our LOHAUS position to state that not smoking anything, traditional tobacco or e-cigarettes, is the best option of all. Not having any cigarettes, cigars, or e-cigarettes would have the maximum health benefits for individual smokers and society as a whole.

However, we understand there are more than one billion smokers world-wide, and that in China, 350 million people are tobacco smokers. We also understand the addictive nature of nicotine makes it hard for some people to quit smoking tobacco, the easiest and most common way to get nicotine. For this reason, we started to investigate ways to reduce the health impact the world's smokers have on themselves, on others, and on society as a whole through alternatives to smoking.

So we did not undertake this decision lightly, and the fact that much of LOHAUS' current initiatives



are in China played an important part in the decision.

China is facing a public health crisis on a scale that has never before been seen. Recent research in China shows that lung cancer has become the biggest killer of Chinese men, and the second biggest killer of women. Smoking directly or inhaling second-hand smoke are by far the dominant risk factors for lung cancer and, according to research in China, tobacco smoking is responsible for 87% of lung cancer cases in the country. In China, lung cancer rates have increased 465% in the last 30 years, a time in which China's economic growth has been phenomenal and has brought hundreds of millions out of poverty. This creates an extraordinary contradiction between economic development and public health.

Furthermore, China has nearly one in three of the world's smokers, but just under one in six of the world's people, meaning that the rate of smoking in China is proportionately larger than one would expect, all other things being equal. If this situation continues, China may have as many as two million smoking-related deaths *every year* by 2025.

Of course, along with the smoking of tobacco, other forms of pollution are contributing to in-

creasing rates of cancer. There is growing evidence in China that air pollution from industry and energy generation is also contributing to the increasing rates of cancer. We addressed this health concern above with our promotion of the use of air filters and plants to purify indoor areas and remove toxins, and for outdoor air quality, avoiding going out on polluted days and using face masks.

So we consider the smoking of tobacco is a separate challenge for LOHAUS, which is why we advocate e-cigarettes. Despite much media attention, many people globally are still not aware of the dangers of smoking, especially when it comes to the effects on other people from second-hand smoke. The laws in most developed economies ban tobacco smoking in all public places, including restaurants, hotels, and even bars.

China also has become stricter in terms of tobacco use in public places, but enforcement still lags behind that of many other countries. In Canada, where I am from, there is practically zero tolerance for smoking around non-smokers. When I arrived in China for the first time in 2003, I was shocked at how many people smoked, in how many places. I visited people in the hospital and saw family members smoking next to patients' beds. Sometimes, even the patients themselves

smoked in bed! More recently I have visited hotels and restaurants that had clear non-smoking signs and seating, but people still smoked. So even today, when the laws are very clear, people violate them flagrantly and establishments overlook this due to the fear of losing business.

As many bars and restaurants found already, the opposite is true. Having a clear non-smoking policy and zero tolerance for violations, some restaurants initially became more popular as non-smokers patronized them to *avoid* the smoking population elsewhere. And bars still do just fine selling alcohol without allowing people to smoke. Many Canadian cities are cold in the winter and smokers are often pitied for having to go outdoors to satisfy their cravings. In Japan, considerate city governments have created *outdoor* smoking booths, partly to increase comfort for smokers but also partly to allay the fear and discomfort non-smokers feel even being near a smoker on the street in the open air. It is socially unacceptable in Japan to smoke while walking on the street, though some still do it.

Yet, in China, despite all the laws and growing awareness of the health risks, why do so many people continue to smoke, even in public places like restaurants, and even in the presence of their children or pregnant women?

One reason is that smoking has become part of culture and communication. When meeting each other, men might offer each other cigarettes as a way of showing politeness. Lighting a cigarette for another person is showing them respect. Giving gifts of tobacco is a simple, non-expensive way to thank somebody for efforts taken on your behalf. And, frankly, smoking is still seen as a very manly activity in China. Mao Zedong smoked. Deng Xiaoping smoked. Almost every Chinese leader smoked. It was one Western affectation that was somewhat tolerated in socialist China due to its association elsewhere with the hard-pressed working class.

Another set of reasons are related to economic incentives, including jobs, taxes and healthcare.

According to a 2012 article in the American Journal of Public Health, China's agricultural tobacco industry employs more than 20 million farmers and supplies 40 percent of the global tobacco crop. In China, 1.7 trillion cigarettes are produced each year. There is even a thriving industry producing fake cigarettes, using sub-par ingredients or counterfeit packaging to sell lesser quality at a premium. From jobs in China's big state-owned enterprises, to those in China's tobacco retailers all the way down to small street-level kiosks, so large is the entire industry in China that nearly

## LOHAUS

100 million people depend on it for their livelihood.

Tobacco taxes account for China's biggest single source of tax revenue. The world's biggest tobacco company is not Philip Morris, now known as Altria, or British American Tobacco. It is China Tobacco, a state-owned enterprise. Combining tobacco taxes and dividends to the state, \$136 billion was collected by China from the tobacco industry in 2013. China's government is addicted to cigarettes in the form of the jobs and taxes they provide, making it difficult to change, or to enforce a policy that will reduce smoking. According to a 2012 article in the American Journal of Public Health, China's agricultural tobacco industry employs more than 20 million farmers and supplies 40 percent of the global tobacco crop. In China, 1.7 trillion cigarettes are produced each year. There is even a thriving industry producing fake cigarettes, using sub-par ingredients or counterfeit packaging to sell lesser quality at a premium price. From jobs in China's big state-owned enterprises, China's tobacco retailers, down to small street-level kiosks, so large is the entire industry in China that nearly 100 million people depend on it for their livelihood. Tobacco taxes account for China's biggest single source of tax revenue. The world's biggest tobacco company is not Philip Morris, now part of the Altria Group, or British

American Tobacco. It is China Tobacco, a state-owned enterprise. Together with tobacco taxes and dividends to the state, \$136 billion was collected by the state from the tobacco industry in China in 2013. China is addicted to cigarettes in more ways than one, making it difficult to change.

Finally, the medical and pharmaceutical companies provide care and medicine to China's millions of lung cancer sufferers.

Surprisingly, tobacco turns out to be one of the biggest drivers of China's economy.

*E-cigarettes are a temporary fix*

While a comprehensive solution to this problem is going to take a long time, individual smokers have the choice between continuing or quitting. However, many people find it difficult to quit, due to the addictive nature of nicotine. Then there is the habit itself, of taking a short break once in a while to smoke. Finally there may be the peer pressure of people smoking around you when you are trying to quit.

There is another solution now: E-cigarettes.

Invented by a Chinese pharmacist from Hong Kong, e-cigarettes are different in that they do not burn tobacco. Instead they use a battery and

heating element that vaporizes particles of nicotine and other chemicals, which are then inhaled and exhaled in the same way as a traditional cigarette. They look like long cigarettes, but can take other shapes. E-cigarette devices are mostly made in China, but the majority are exported at present, despite China being the world's largest market for cigarettes.

With a similar look and feel to cigarettes, e-cigarettes can deliver the nicotine with the use of far fewer chemicals. Therefore, one of the primary dangers of smoking, the inhalation of dozens of toxic chemicals, is dramatically reduced. So are effects on others due to second-hand inhalation of those same chemicals found in tobacco smoke, though long-term studies are yet to be done on the effects of second-hand vapor inhalation.

Furthermore, as a relatively new product being on the market for about ten years, there is still not much scientific proof that e-cigarettes are actually healthier and reduce cancer rates. Such long-term studies will take many more years to know whether the benefits are truly significant but, in the short term, anecdotal evidence among people who smoke and have tried e-cigarettes shows that the reduction in tobacco smoke benefits their lung health. E-smokers, called vapers, claim to be able to breathe easier and exercise more. There is

also a benefit of near total reduction of tobacco smell because e-cigarettes have no natural flavor, just added flavors, which include mint, mango, green tea, and yes, even artificial tobacco flavor.

At LOHAUS, we use a brand called QT2, started by an American named Mario Cavolo, who is a collaborator in our work at LOHAUS. Mario is a long-term smoker who switched to e-cigarettes. He found the existing brands and styles on the market to be inconvenient and so he created his own style and brand. QT2 e-cigarettes are made in China, and we have offered them in LOHAUS to our customers who want to live a healthier lifestyle. We still however require smoking to take place outside, except on special QT2 awareness events.

So, if you don't smoke, don't try e-cigarettes and don't start smoking. If you do smoke, try to quit. If you can't quit, switch to e-cigarettes after a careful consideration of your health situation and preferably in consultation with your doctor. Your non-smoking friends and family will probably thank you, and you might just enjoy a better quality of life thanks to better air quality.



This chapter was all about making air quality, both outdoor and indoor, a prime concern for



## LOHAUS

your lifestyle of health and urban sustainability. I have focused so far on the reasons why air pollution is the biggest challenge our society faces today, why it is the number one thing you should be concerned about as an individual, and how you can look after you own air quality individually.

I have not talked about the larger and more impactful ways that society at large can improve its air quality, including greater energy efficiency, clean energy and more. Those will be the main topics of the next chapter, where I introduce the holistic building concept and its implications for both health and urban sustainability.



### 3

## NET ZERO BUILDINGS

**T**he word holistic has, for some people, a New Age connotation that is not entirely positive. It is associated with holistic medicine, which some feel lacks a scientific basis of empirical proof. When I arrived in China, I was introduced further to the concept of Traditional Chinese Medicine (TCM), which takes a holistic approach to human health. TCM treatments may take longer but are generally less invasive. At times, TCM involves treating imbalances in the body's *qi*, or energy, which can neither be felt directly nor observed. Although I'd encountered the concept many times before in studies of martial arts and *feng shui*, I was somewhat skeptical at first of doctors who claimed to understand the condition of my *qi*. However, I was treated successfully enough times with various TCM remedies that I realized

there was something to it. To be sure, it is not a cure-all, and I now use a combination of TCM and Western medicine approaches for my personal health care.

What's more, I have come to see the wisdom in looking at overall health, rather than the treatment of symptoms as they occur, as a preventative approach to healthcare. This holistic approach, I realized, can also be used in other areas of our lives. In particular, in how we live, work and socialize in our urban buildings. This is the main focus on this chapter.

LOHAUS as a concept was inspired by both LOHAS – a lifestyle of health and sustainability – and Bauhaus, the German architecture and design movement of the 1920s and 1930s explained earlier in the introduction.

The holistic building concept that I have created at LOHAUS is an extension of one of the Bauhaus principles. Namely, considering the building, its occupants, its place in the urban landscape, and its connection with other neighbors -- to form an integrated whole that is greater than the sum of its parts.

This approach encompasses ways of using your lifestyle and the buildings you live and work in to decrease environmental impact. This includes re-

## LOHAUS

ducing waste and saving energy – through energy efficiency, changing your fundamental energy demand and generating your own clean energy – in ways that benefit you and others in society.



### **REDUCING ENERGY WASTE**

Since beginning our LOHAUS mission, we have always made it a priority to reduce waste. This includes both physical waste, in the form of garbage, and energy waste, which means inefficient or unnecessary energy use. Herein we focus on energy waste.

We have done our best to use the most energy-efficient technologies and best practices for sustainable buildings from around the world at LOHAUS. Being in a 1930s building and wanting to preserve its unique architectural heritage and Shanghai characteristics was a challenge, but the improvement in both energy efficiency and comfort has been dramatic.

We also wanted to feature ideas within almost anybody's time, budget and capability limitations. We are confident that these ideas not only help make our cities more livable and our lives more comfortable, they are also affordable and, in some cases, save significant amounts of money over

time. We therefore encourage the public through our outreach efforts to do similar activities in their own homes and offices as the first part of a holistic urban building strategy.

So here are four ideas that everyone can use to reduce their energy waste at home, in the office, or in any building in which you are active.

### *Insulating carpets on the floors*

LOHAUS is in a 1930s-era Shanghai building. The wooden floors look great, but let too much air – and noise – flow through gaps in the floorboards.

We put insulating, locally produced, sustainable hemp-fiber carpeting in many of the rooms and corridors. This has made the space warmer in the winter and allows less noise to travel all year round.

### *Insulated roof, roof deck, and sub-floor*

One of the biggest problems for LOHAUS in the long Shanghai summer was the roof and roof deck getting too hot. With air temperatures reaching 38 C (100 F) or higher, surface temperatures on the ceramic tile roof deck could be 55 C (131 F). You could fry an egg on it! And the brick roof over a light plaster/wood beam ceiling made the top

## LOHAUS

floor feel like an oven. Those top floors were almost unusable without maximum air conditioning at significant cost. The bottom floor of the building had no basement to speak of, just a sub-floor that was essentially dirt from the ground on which the building sat. In the summer, characterized by high humidity and a several-weeks-long rainy season, water damage and mold were problems. In the winter, the floor was bitterly cold.

We worked with BASF and one of its China-based distributors, Broadway, to install Neopor high-efficiency foam insulation in the roof, under a new wooden deck, and under a renovated sub-floor that was partially concretized and sealed to prevent future water damage.

The results were impressive. During the winter, the top and bottom floors are warm and comfortable. In the summer, the building stays cool. And the wooden deck looks great. Just don't try to fry an egg on it.

### *Triple-pane windows*

The efficiency of a window comes from how thick the glass is, as well as how air-tight the frame is. After uninsulated roofs and floors, windows are the next biggest source of heat loss in the winter and heat gain in the summer. The antique win-

dows in the 1930s-era LOHAUS Shanghai building had thin glass, air leaks and little noise insulation from the outside traffic. Somewhat surprisingly, the frames set in the concrete and brickwork had no sealant at all. You could literally feel the air blowing in or out depending on the pressure.

In order not to lose the classic look of the antique windows, we left them in the frames and then custom-designed a hand-made double-pane window to go into the frame on the inside. The result? Essentially a do-it-yourself triple-pane window. The LOHAUS windows now provide excellent sound-proofing and insulation value. Despite being custom-made in an antique style, they cost much less than factory-produced windows because they were made by a neighborhood vendor.

### *Weatherproofing*

Every building has air leaks. Some of these are by design, to allow air to flow through the roof and basement, which prevents moisture from building up and causing mold. Some are caused by necessity, such as doors opening to the outside world. Short of using an airlock, it is almost impossible to reduce air leakage 100%, but there are some areas of the home that are leaking air all day long, 365 days a year, reducing the energy efficiency and comfort of our buildings.



## LOHAUS

Many of these leaks are found around the frames of the openings in the building, such as door and window frames. It is difficult to attain a perfect seal between concrete and metal, for example, and the natural expansion and contraction of different materials under temperature and humidity variances is a problem builders have been struggling with since humans started living in artificial dwellings.

In the summer, you might open windows and doors to introduce cooling air, but if you are using air conditioning to cool rooms in hot climates, the doors and windows should be sealed. Otherwise, leaks around the frames allow warm air from the outside to enter and vice versa, depending on the air pressure, decreasing our buildings' efficiencies. In the winter, the opposite problems occur due to air leakage.

There may be other openings in the building, such as for cables for electricity, telephone and air conditioning tubes. Poorly sealed, these holes allow large amounts of air to enter or escape, increasing our energy bills and decreasing comfort.

When we opened LOHAUS in June 2013, the building had all of these problems.

The simple solution is *weatherproofing*, which basically means sealing the openings. First, you

must identify where the air is entering or escaping. This can be done with a combination of tools. The simplest is a stick of incense. Light it and move it so its smoke is flowing near the edges of any opening. If you notice a dramatic change of flow of the smoke, that's an indication of an air leak. A more technological method involves infrared spectrum heat analysis tools, such as a camera that can see heat signatures. Areas of heat are usually encoded as reds and oranges, while areas of cold are displayed in blues or greens. The desirable temperatures in between are a range of colors. Using this kind of device to look at a window will show distinct bands of color, which indicate a difference in temperature.

Ideally, a door or window should be the same color as the surrounding walls and window frame. If you are using single-pane windows with little insulating value, the thermal reading will essentially show the difference between outdoor and indoor temperatures. If you are using double- or triple-pane windows, as we do in LOHAUS, you will see much less color difference in the readings because the inner windows are much closer to the internal temperature of the building.

Once you have identified the leaks, they need to be sealed.

## LOHAUS

Various methods for sealing exist, depending on what kind of materials you are trying to seal. You might fill small leaks with silicone or latex caulking, and bigger openings can be filled with foam insulation that expands into the gap and is then covered by drywall. Air is actually one of the best insulators, so if you can trap some air into pockets and then seal it, this works OK but you need you be careful of condensation, which is caused by water vapor in the air condensing on whichever surface is cooler. Dry air can prevent condensation.

For example, in order to prevent condensation on the inside of a multi-paned window and increase its insulating value, the air between panes is either dried, or is drawn out and replaced by pure gas such as argon, which has a higher insulating value than air and holds no water vapor. Although difficult to do at present, a vacuum between the panes would actually be the most efficient insulator of all. No heat transfer can take place across a vacuum, nor is water vapor present. For the time being, argon gas double- or triple-pane windows are usually the best, and more expensive.

Doors can be weatherproofed as well, although not completely in most cases because sealing the door opening too well makes the fit too tight, which is then difficult to open and close. Sealing

around doorframes where the door meets the doorframe can be improved significantly with the use of foam "D" "B" or "P" weatherproofing strips, which adhere to the edges of the door and frame with their glue backing. When the door closes, they make a compressible seal. Where gaps are possibly larger, such as at the doorsill, something like a door brush or a flexible rubber fin can be used to close the gap.

Other openings, such as the gaps between cabling or the air conditioning tubes going to the outside, should not be permanently filled, which would make maintenance difficult. At LOHAUS we use a do-it-yourself combination of plastic wrapping, which you crumple into a ball and then stuff into the opening to fill most of the gap, and then tape over with duct tape. Putty, such as Blu-tack can effectively fill and seal the smaller gaps. Both methods are easily removable for future changes.

## **ENERGY EFFICIENCY IMPROVEMENTS**

Once you are finished reducing energy waste in your buildings, the next step is to switch to more efficient energy use strategies. One of these strategies is to pick the more efficient of several options available. Let us first look at areas where both new and old technology can be more energy efficient at home and work.

*Air Circulation*

A simple fact of life is that our bodies must regulate heat. We have built-in biological systems that help to do this, much of the time without us even noticing. When we are cold, we might shiver, generating some heat. When we are hot, we sweat, which allows the perspiration on our skin to evaporate, which is an endothermic cooling reaction.

And we all should remember another basic scientific fact from school: hot air rises. In a six-level loft building such as LOHAUS, this effect makes the bottom floors cooler. Heat gathers at the top. If you happen to be living in an upper floor during the winter, you may benefit from your downstairs neighbors' heating. But in the summer, you might be sweltering due to the same effect.

Every climate is different, and the weather in Harbin is certainly at odds with the weather in Hainan, but in Shanghai the common solution is to put air conditioners in each room and keep the doors closed, leaving the corridors hot in summer and frigid in winter. This is terrible when you need to go to the shared bathroom on a cold winter night!

Fortunately there is a simple solution to both problems: electric ceiling fans. It is a better, sim-

pler and less expensive way to keep the temperature comfortable year round using air circulation in combination with the energy waste reduction strategies mentioned above.

At LOHAUS we installed traditional high-efficiency ceiling fans on almost every floor. They use much less energy than air conditioners and mix the air for more even heating or cooling, depending on the time of year. Like a summer breeze, the movement of air alone can make you feel two or three degrees cooler, thanks to better evaporation. In the winter, the fans can force heat back down for better mixing and stable temperatures throughout the entire space.

### *Lighting*

For many commercial buildings and offices, a significant use of electricity will be for lighting, as much as 20-40% of the total for many buildings, depending on their main function. In residential buildings, light tends to be between 10-20% of the electricity bill because of the greater use of relatively inefficient small heaters for space and water. Nevertheless, lighting is one of our society's greatest uses of electricity overall.

You might have had a parent who was obsessive about turning off lights when nobody was in the

## LOHAUS

room. When lights were of the traditional incandescent variety, this actually made some sense. Incandescent bulbs, including new halogen bulbs, are energy inefficient, wasting much of their energy as heat rather than light. These bulbs get so hot, in fact, they will easily burn your skin or even start a fire if they are too close to fabrics.

The next most common form of building lighting, used since the 1940s, is fluorescent lighting. By creating long vacuum tubes with a small amount of mercury vapor inside, and coated with phosphors which glow when hit by electrons discharged from the mercury vapor, a new kind of light was created. More energy efficient and longer lasting than incandescent, fluorescent light tubes became the norm in offices world-wide. They were used less often at home because their light was a harsher bright white, even flickering at times. This was acceptable for cost-conscious commercial buildings, but not acceptable to most consumers, who preferred the warm light provided by incandescent light bulbs.

This situation didn't change until further innovations in fluorescent lighting, including better phosphors that gave off warmer colors and the creation of Compact Fluorescent Lights (CFLs), those ice-cream-cone-style bulbs that can fit in a standard lamp socket. In China, CFLs are known as

“energy-saving bulbs” for their main attribute for consumers versus incandescent bulbs. CFLs still contain small amounts of mercury. If they break, there is a slight health risk to the individual, but the bigger danger is to society as those millions of fluorescent tubes and CFL bulbs go to landfills to be disposed of. The mercury released *en masse* affects the soil and air. Finally, and perhaps most damning of all from the consumers’ perspective, the type of light that CFLs provide is still considered by many people to be somewhat harsh on the eyes, though still better than the larger fluorescent tubes. The energy savings was enough to attract a fair number of consumers.

All that considered, it is surprising to some that these so-called energy-savings bulbs are actually not the best anymore. Today, there is a better alternative, and that is LED lights.

In fact, newer generation LED bulbs are better on almost all accounts. They are less polluting in terms of hazardous materials, as they contain no mercury. They use much less energy than even the most efficient CFLs.

In fact, while LED is the newest type of light bulb, it is not a new technology at all. LEDs – light emitting diodes – have been around for decades, in our computers and electronic devices, for ex-



## LOHAUS

ample as the little red, green and blue lights that tell us when the power is on. Once available in only those basic colors, in the last decade white LEDs became possible and then more cost-effective to manufacture. And, in just the last two or three years, we now have pretty much any color, such as the Philips Hue line of LED bulbs which are controllable from your wireless network and can change to any of 16 million colors almost instantaneously. This means that there are new choices for home use light bulbs that are both the most energy-efficient and also can provide warm yellow light that is easier on the eyes and closer to the type of light we had with the traditional incandescent light bulbs. Finally, LED light bulbs are now offered in almost all lamp socket formats, even being retrofitted into fluorescent tube sockets.

As a result, switching all your older bulbs in your home at once to newer LED bulbs is a great way to notice an immediate impact on your electricity bill while keeping your quality of life the same. And if you enjoy changing colors of light to reflect your moods, LEDs are even better.

China is the world's largest producer of LED light bulbs. Yet they are not widely used domestically due to the expense compared to traditional incandescent and CFL bulbs. Most LED bulbs are

rated at 25,000 hours of operation, making them far longer-lasting than every other bulb type – ten years or longer. There is also a lack of awareness that a better bulb exists. Changing this information gap was literally an inspirational idea in the form of a light bulb! And so our pioneering LED Lighting Project was initiated in 2013.

At LOHAUS, we started by switching *all* of our 70+ light points, even the older LCD computer projectors, to LED. Not only did we immediately start saving hundreds of *yuan* a month, we also noticed our space was much cooler in the summer. That's because LED bulbs generate less waste heat. You can even hold most of them in your hand when they are on. Finally, because of the availability of different socket formats and colors, they can be used equally well in homes or offices. Based on the direct savings on electricity used for lighting, and the indirect savings on using less air conditioning in the summer because the waste heat from lighting is reduced significantly, we estimated less than two years payback time on our investment in LED bulbs.

The next steps in our Lighting Project include encouraging others to use LED bulbs. We've done this with several awareness events. We've even changed light bulbs for others for a low service fee. And we gave free sample LED lights to some

## LOHAUS

of Shanghai's senior citizens as part of an exchange for older, non-working bulbs to be recycled.

Clearly for LOHAUS, LED is a core energy-saving technology that we believe will result in a phenomenal one-time decrease in urban electricity use, from 10 to 20 percent, as soon as everyone switches over. So, the sooner the better.

Along with LED bulbs in the home and office, changing other equipment and appliances can offer good savings.

### *Switching to more energy-efficient appliances*

Energy-efficient appliances are another way to save significant amounts on your energy use and lower your carbon footprint. Electric water heaters, refrigerators, air conditioners, televisions and washing machines are usually the biggest users of power.

Don't forget Internet routers and computers, which might remain on 24 hours a day. These devices may not use as much power per unit of time but, left on constantly, they still use a large amount of power overall. Then there are the appliances such as TVs or DVDs that, though appearing to be turned off, remain plugged in. Some-

times these are called vampire appliances, because they are still using electricity even when they appear to be turned off. In reality, they are never fully off, they are constantly using power and, in a large household with several people each owning their own such devices, their effects can add up quickly.

To begin to make improvements here, first look at your existing appliances that are not the most efficient. You might think that, because they are not broken, it is wasteful to replace them. This is something of a sunk-cost fallacy, meaning that you might end up paying more for them through higher energy costs than if you replaced them today with the most efficient models.

Look for the highest-rated (lowest energy use) appliances on a per unit basis. In other words, it is not the size of the device, but how efficient it is. A bigger refrigerator can be much more energy-efficient on a per liter of storage capacity basis than a small “beer fridge,” but this doesn’t mean you should have a full-sized refrigerator in your entertainment room just to store a six-pack of beverages. In fact, the best solution from an energy perspective would be to skip the mini-fridge altogether and just have one larger appliance that is perfectly sized for the requirements of your family, located in a central location convenient

## LOHAUS

for everyone. Right-sizing matters. Over-filling your refrigerator is also not a good idea because it inhibits air circulation inside the refrigerator, meaning that the compressor has to work harder, using more energy in the process.

The same with air conditioners and heaters, where a bigger device might be more efficient, but getting one that is too big for your home is going to waste energy. Going too small and constantly running the devices at maximum will likely result in shorter lifespans and repairs. So, pick the most energy-efficient device that is also the right size for your room or building.

An added benefit of replacing old appliances is that many of the new, energy-efficient appliances will be the most technologically advanced, giving you additional information on how to better regulate your energy use, including automatic control via wireless devices. This might allow you to, for example, turn off the heat automatically when you are not at home, or automatically turn off lights when you are not in the room. "Learning devices," such as the Nest thermostat, will monitor your usage and living patterns and automatically adjust to the most efficient settings.

Once you have switched to the most energy-efficient technologies and devices available, there

is really only one way left to reduce your energy usage and have an even smaller carbon footprint. You must fundamentally change the ways that you approach life, so that your energy need decreases dramatically. Imagine if, for example, you decided to sell your refrigerator altogether and survive only on what the local economy is producing in local restaurants and stores. Or, imagine sharing a larger refrigerator with not just your immediately family but ten other people. It might sound a little crazy at first, but that is the nature of the change that you and everyone will need to explore in order to make our world more sustainable. That is the topic of the next section.

### *Changing your energy needs*

Once you have implemented energy efficiency improvements and reduced your energy waste, the next major step is to change your fundamental energy needs. Some of this involves switching to newer and better ways of doing something; other ideas involve changing behavior. By doing this on a daily basis, you can also make as positive an impact on yourself as on society.

### *Reduce commuting needs*

You could move to a place close to where you work so that you won't need any transportation

## LOHAUS

other than your own two feet. This strategy is sometimes hard to implement if you have bought your own home and can't easily move closer to work. Renting a new place and allowing somebody to rent your own home is an option that not many consider, preferring to commute a long distance. I really have to ask people why they are willing to give up one, two, or more hours every day of their working lives in this way. Over time, the commute adds up to days and weeks and eventually months of your life spent just sitting, usually in a car or on a subway.

There is a better way. Just move. The time you will gain is almost always worth more than the cost of additional rent.

Some of us are still thinking that money is the most valuable commodity we can have. In fact, it is time. In the New Economy, your time is one of the greatest opportunity costs. There are now plenty of things to place your attention on. Websites and other media fight over your 'eyeballs' and 'impressions' because they have a dollar value attached to them, the amount of money advertisers are willing to pay to be seen. If you can believe in this new paradigm, then finding ways to save as much of your time as possible from relatively unproductive time such as commuting, the richer you will be.

Another strategy is to live in the middle of the city so that, wherever you go, you are always relatively close. This is something I have done in Shanghai for the last decade. By living in nearly the exact geographic center of the city, I can save so much time by walking, taking the subway or, when necessary, getting to where I need to go by other forms of transportation.

Finally, if you are a freelancer or person whose job allows you to work relatively independently without a lot of meetings, than working at a coffee shop, shared work space, or at your home are other options. Using your home as both living and working place is part of the SOHO – small office, home office – trend. Using SOHO doesn't mean you can't have employees, as long as the location of your office is convenient for them as well, reducing travel requirements for everyone. Refusing business trips might not be good for business, and missing meetings might not be good for your career, but finding ways to avoid them will reduce your transportation carbon footprint significantly. Teleconferences and video conferences and even social media like WeChat now allow the type of communication that used to be possible only with face-to-face meetings. In extreme cases, using a robot avatar that roams the office with your disembodied face synched onto a eye-level screen attached to the head of the robot can create the



## LOHAUS

semblance of a face-to-face interaction. This is only a half-exaggeration, but the idea is already being tried in a number of formats in an effort to give teleworkers a more substantial presence.

Commercial office buildings are some of the world's largest energy users. So, essentially getting rid of the office, or using the office space more efficiently, as in the case of hot-desking, in which the same desk is used by different people at various times of the day or week, can impact your energy needs. Of course, you can keep the office too, and instead try to make the building itself more efficient, as we have done at LOHAUS as detailed in a previous chapter. You can actually go one step further, sharing your office with others.

Sharing your working area with others could be as simple as working in a traditional office and sub-leasing, or you could set up a co-working space, a much more flexible work arrangement, as we have done at LOHAUS. The benefits of co-working are more than just spreading fixed costs over more people. Co-work space users also get to meet other people and share ideas, which people working through sub-leasing may not.

We've just discussed some work-related solutions for reducing your energy demand. What if the so-

lutions above are simply not options for you? The next biggest area for reducing energy demand is at home.

### *Change your living style*

When you think about it, the way most people live today, individually or in small family units, is quite different from in the tribal past where people lived communally and in larger families. Unintentionally, people were living more efficiently and sharing resources without ever thinking twice about it. As discussed earlier in the section about the sharing economy, this was just the best way to do things.

Today, when it comes to our homes, we usually are in them for less than half of the time and spend the other half out working. This is especially true for apartment living when you are single.

If you are living alone, in a large area, you are using more energy on a per person basis because you need your own refrigerator, your own air conditioner or heater, as well as lights and Internet and telephone services. I've done this at times in my life. Aside from being somewhat lonely, I was not being very sustainable. I would come home, turn on the heat or air conditioning, turn on the lights, make dinner for myself and otherwise use

## LOHAUS

electricity for one. I got to thinking, how does our modern independent lifestyle fit with sustainable thinking?

One way to improve such situations is to decrease the size of your living area so that you will not need as large an air conditioner, and illumination will require fewer lights. In some countries, like the United States, the preference is for very large homes and apartments, which naturally require more energy to operate. In places like Hong Kong, people live in small micro-apartments, sometimes called rabbit hutches. Japanese people often live in similarly economical small apartments and homes, and, commercially, are famous for their capsule hotels.

This might partly explain why per person energy use for Americans is among the highest in the world. By comparison, the Japanese are relatively frugal, with about sixty percent of the energy needs of a typical American. Hong Kong people are paragons of efficiency, needing only half of what the Japanese do. To be sure, industrial production and productivity has something to do with it as well, with the Germans being almost efficient as the Japanese on a per person basis. Canadians are similarly wasteful as their American neighbors. Other countries that use even more energy per person than the United States include

Luxembourg, Singapore, Kuwait and Brunei, all wealthy countries on a per capita basis. Could it be, then, that wealth is another factor in energy use per person? No doubt there is a correlation, but it is also true those countries are much smaller, geographically speaking, than all the others -- meaning that they might need to generate energy through relatively inefficient ways.

My feeling after having lived in Japan for five years, having visited Hong Kong, and having lived in Canada and the United States for extended periods, the way people live at home has a big impact on their energy use. Japanese are among the best I have ever seen at using their space to the maximum, with tiny showers and toilets in an aircraft-sized bathroom, for example. The small floor area of a typical Japanese apartment means energy-using devices, such as air conditions and televisions, can also be small. There is a reason why small, whether in Sony Walkmans or notebook computers, became synonymous with Japanese taste and industrial design. It was necessity. And smaller devices, in smaller homes, tended to use a lot less energy.

Other than in Hong Kong, the trend for the newly prosper in the rest of China, however, is to buy big: Big houses, big cars, big TVs. At present, the mainland China energy use per person is still less

## LOHAUS

than that in Hong Kong, but perhaps not for long, as more and more people urbanize and become big spenders. Everyone wants to show off their wealth, so they use more and waste more. But it is still not too late to change. At the national level, the Chinese government has additional taxes for large, luxury homes and bigger-engine cars, but it is ultimately up to the consumer to make the choice of where to live and what to buy.

Making a conscious decision to live in a smaller apartment will generally save you money on rent, as well as reduce the energy you need to use.

The amount of money that is spent on heating and cooling in many homes ends up being the biggest energy cost for many. This actually applies to any building where human comfort is a main objective. Using the so-called passive house, from the German *Passivhaus*, building method, is one way to reduce heating and cooling costs almost to zero. While it is easiest to implement in a new building, older buildings can sometimes be retrofitted as passive houses. The core of the passive house method is use of insulation everywhere, triple-glazed windows, and air-tightness of the building with a special ventilation system and a heat pump to regulate temperature. The angle of the roof, its orientation, and the amount of shading and other factors are all taken into ac-

count so that you can maintain a consistent temperature in the house throughout the year, in every room, without additional heating and cooling needed.

You can also make new lifestyle decisions and behavioral changes that will impact your home energy demands significantly. For example, you can share your living area with others. Get a roommate, or move in with your partner while you are dating.

And while it is comfortable to take a long hot bath after a hard day at work in the winter, baths themselves use a large amount of gas or electricity to heat the water. If you share bath water, Japanese style, the cost might not be so high, but you can reduce your energy demand significantly in other ways.

First, take shorter showers. Almost anyone can reduce the time they are in the shower. Move faster, or do less. I try to take a five-minute shower as my normal morning routine. When I lived in Japan, I enjoyed taking a shower first and then using the bath, with everyone in my host family sharing the same water. I even once lived in a Japanese company dormitory shared by several dozen coworkers. There was shower area with small stools for sitting, and then a big communal bath, all in the

same room. It was comfortable and energy efficient.

Those are some of the broadest ideas for how to significantly change your energy demands through behavioral changes. After you have undertaken all the energy waste reductions, energy efficiency improvements, and energy demand changes that you are willing to do, the last and final step to an improved building, whether home or office, is to think about generating your own energy from a clean source such as solar or wind. This will allow your building to become a so-called carbon neutral building, with supply and demand in balance. Or, if you generate enough electricity, it can actually be a carbon negative building, generating more electricity than it actually uses.

### **MAKE YOUR OWN ENERGY**

One of the main problems of sustainability in our society is that electricity is generated in different places from where it is used, entailing enormous expenses in creating and maintaining power grids, losses in transmission over long-distance electricity lines, and inefficiency in the form of pollution as a byproduct of fossil-fuel-burning generation methods, such as coal and natural gas.

The challenge that we are examining at LOHAUS is how to live in cities in a more sustainable way. At our LOHAUS building we began using many sustainable technologies and practices, but one of our most fundamental needs, electricity, was still mostly coming from the Shanghai's power suppliers. They primarily use the burning of fossil fuels, as well as a small amount of thermal energy generated by trash incineration, to generate electricity.

There was really nothing we could do about this, other than improving efficiency, reducing waste, and changing demand, all as detailed above, all of which we did.

For example, we switched to more energy-efficient LED light bulbs. To reduce waste, we installed better insulation, added double-paned windows on top of the existing single-paned windows, and sealed leaks as best as we could. All of these improvements helped us prevent energy loss through the walls and windows during Shanghai's hot summers and cold winters.

In fact, we could reduce our waste to practically zero by using even more efficient technologies and practices, but no matter what we do short of stopping our business entirely, we couldn't reduce our energy usage to zero. We still needed to



## LOHAUS

use computers for work, air conditioning for cooling in the summer, refrigeration for food and beverages, and of course, lighting.

We decided to take a radical step that was then, in 2013, almost unpracticed in all of China. We would start generating our own energy for our building. Clean energy.



There are many kinds of energy that can be generated in a residential or commercial building. Some are polluting, because they involve combustion of hydrocarbons in the form of wood, coal, oil or natural gas. Other forms are non-polluting, or *clean*, because they are generated in a way that does not require combustion. This is not meant to be an exhaustive list, but the most common forms of clean energy able to be used in urban areas include solar, wind, and geothermal heat pumps.

First, before talking more about which clean energy to use, it is important to understand energy itself as something distinct from electricity. As defined in physics, the energy of something is its ability to do work, which is measured in joules. Energy is a fundamental force of which there are many different kinds.

You can have mechanical energy, such how a bicycle converts your body's chemical energy – which comes from breaking down sugars, as described earlier in the chapter about health and diet – transmitted through your muscles into power to drive the pedals, the chain and finally the wheels. There is thermal energy from heating, such as by burning biomass, or using the power of the sun to run a solar hot-water heater. Thermal energy also includes heat pumps, which take advantage of the temperature differential between two locations. For example, geothermal heat pumps, which use the constant underground temperature to heat or cool a space above-ground. Then there is solar photovoltaic energy, which is the sun's photons converted into electric energy.

At LOHAUS, our main way of generating *clean* energy is from solar photovoltaic (PV) panels. We decided to install solar panels on the roof, to convert a percentage of the sun's energy into electricity. We then use some of that electricity for ourselves, and sell some to the power grid.

We picked PV panels, rather than another form of solar energy such as thin film or solar thermal. In fact, China is the world's largest producer of all solar equipment, but especially solar panels. China's manufacturers sell them all around the world. Solar PV installations, from the size of single roof-

## LOHAUS

tops up to utility scale solar farms, are increasingly found in some of the world's poorest countries. These countries are, in effect, able to bypass the need for a reliable national grid and fossil fuels by having smaller, local grids powered by solar. At the same time, solar power is increasingly found in and around large cities in Western Europe that are among the richest cities in the world. Despite being the world's manufacturer of PV, and despite all the installations found globally, whether in rich or poor nations, China itself is not one of the world's largest *users* of solar power. At least, not yet.

We decided to explore this contradiction by installing our own solar PV rooftop on the LOHAUS building. This would allow us to generate our own electricity, and be more independent from the electricity grid. We would still need to be connected to the grid for the simple reason that solar power doesn't work at night. The cloudier the skies in bad weather, or the hazier from air pollution, the less efficient the panels. Thus, without a more complex battery system for energy storage for times when the sun is not available, you risk running out of power.

At LOHAUS, we did something that was not very common in China at that time. We felt it was important for our system to actually be connected to

the electricity grid directly. In many solar power installations in homes and other buildings around the world, many of them are *off-grid*, meaning that they provide energy to the building occupant but that energy must be either used or stored, or it will be lost. By connecting enough batteries to the system, you could essentially store and use as much as you generated. But, as panels get more efficient and solar installations get larger, more and more energy will be produced that might not be able to be used. Traditional batteries, and even newer larger *flow* batteries, take up a lot of space. Fortunately, there is a new type of battery available in China, or maybe it is better to call it a *bank*: the power grid itself.

By connecting your solar system to the electric grid with a two-way meter, you can both buy and sell power. If you need electricity, you use it from your own panels first and then the rest automatically comes from the grid. If you are not using your own power, you automatically sell it to the grid, and that money you earn is like a bank account balance. You have a positive balance, meaning that you have sold more to the grid than you bought. If you have a negative balance, you have to pay up the balance to zero each month. This is the system we are using at LOHAUS.

## LOHAUS

It was only made possible by a new government policy, announced in 2013 and finally implemented in 2014, to stimulate installation of grid-connected solar energy.

We wanted to explore what this policy actually meant for consumers, so we made additional efforts to make sure that this would be a part of our solar energy plan. In fact, LOHAUS became the first building in downtown Shanghai, and only the second building in the entire city of more than 23 million people, to build a grid-connected solar power station on its roof. We also happened to be one of the oldest buildings, if not the oldest, to have a solar rooftop in all of China, thanks to our 1930-era building's architectural history. In many Chinese cities, where the replacement of traditional *longtang* – lane houses – and *hutong* – courtyard – housing is rapidly changing the nature of downtown neighborhoods, we have shown a sustainable path forward by restoring an old building.

In the months following our installation of solar PV on the roof, the system is doing what it is supposed to do, which is generate power, day after day. It has needed no maintenance aside from an occasional cleaning of the panels to remove dust and rainwater residue. Our system is not large, so most days we are using all the energy generated

in our own building, but that means we don't have to buy as much power from the grid as we once did. We are not making huge amounts of money selling to the grid either, but based on the calculations so far, our system will pay for itself in five to seven years depending on the amount of sunlight during that period. We hope there will be fewer and fewer smoggy days as more people start to reduce their energy use and generate clean energy themselves.

### **USING OTHER TYPES OF CLEAN ENERGY**

The choice of clean energy is not just about financial considerations, it is often dependent on the location and size of your building. There's no one-size-fits-all.

From a financial perspective, for most people, the cost of the equipment, the installation cost, the expected operating and maintenance costs, the amount of electricity that can be generated under typical conditions, and the price of electricity from other sources are the biggest factors in their decision. Using these numbers, you can generate the payback period. This is how long it takes you to make back the costs, or break even. Thereafter, you start saving or making money, and can generate a return on investment. All of this is compared with the next best alternative, which is usually

## LOHAUS

buying electricity from the grid and investing your money elsewhere.

Where today we might think it is not cost-effective to install some kind of clean energy system, because the payback is long or the return on the investment is low, some people elect to do it anyway, for the social good that clean energy provides. They are essentially sacrificing their own return in order to help society, which in most parts of the world does not price pollution into the cost of electricity.

We may also imagine a time in the not-too-distant future where the costs of the equipment come down even further, so that the payback time is reduced and the decision is easier to justify. The end-game for financial considerations taking precedence over the health and environment benefits that clean energy provides is also near at hand. As the former Saudi Arabian Minister of Oil, Sheikh Zaki Yamani, said, "The Stone Age did not end for lack of stone, and the Oil Age will end long before the world runs out of oil." I believe that cheap, essentially free, clean energy will be available in all major economies within 20 years, and globally within 50 years. One less thing to worry about, as Forrest Gump might say.

A second consideration is *which kind* of clean energy system to use. This is complex as well, but geography often provides the right clues.

Locations that have a consistent wind, such as those located near a sea shore, might be suitable for a wind turbine designed for use on top of or next to a building. These are not utility-scale turbines that may be dozens of meters high and tend to draw NIMBY – not in my backyard – protests due to noise, ecological damage such as bird deaths, or aesthetics. Rather, they are smaller residential or rooftop units. As a result they are unlikely to draw many complaints from neighbors. Personally, I think few things are as elegant as a large wind turbine turning slowly in the wind, but I recognize there are limits of course to what people will accept if they have to look at it every day.

Other types of clean energy, such as geothermal heat pumps, work almost anywhere, because they take advantage of the heat from the Earth, which is consistent year-round below a certain depth. They work in hot or cold climates. Small building units might use a pipe which goes a few dozen up to a few hundred meters underground. At the national level, some countries, such as Iceland, with its glaciers and large number of active volcanos, have unique geographic and geologic conditions.



## LOHAUS

Iceland generates essentially 100 percent of its electricity from clean energy, in the form of hydroelectric dams on the rivers and near-to-ground volcanic hot springs, which can be used for not only heating its buildings but, due to the very high temperatures exceeding 200 C close to ground, can be used to efficiently generate electricity as well.

Other countries, such as Norway, are exploring so-called deep and ultra-deep geothermal heat pumps, which use oil-drilling technology to bore up to ten kilometers (six miles) into the Earth to reach temperatures that Iceland has near its surface.

Whatever type of clean energy you are using, and whether it is provided for you at the national level by your utilities or individually, our world can always use more clean energy and less burning of biomass and fossil fuels.

Clean energy is a gift from nature that we would be foolish to reject. Coal and oil are also a gift, but one that we must learn to treat as more precious, for it comes with a very high cost that will only appreciate the more we use, so we should save it, in effect, for a rainy day instead of using it all at once.

In order to make the most of any of these gifts, it is important to not only generate clean energy but, as we also looked at in this chapter, to increase efficiency and prevent waste of energy as much as possible. If you are generating a great deal of clean power from your solar panels but you use it for older incandescent light bulbs, you are lessening the positive impact and reducing the benefit to society.

Until the time when energy is nearly free because we have so much clean electricity, an optimistic belief, we all should treat our electricity as a gift that should not be squandered. That is why we make it an important part of our mission at LO-HAUS.



As described throughout the book, I hope that you are now getting the impression that living a life of health and urban sustainability does not mean a life of sacrifice. In fact, it means living life better. Continuing that theme, the next chapter of this book looks at how we are using technology in new ways, to help manage our urban life without losing the quality that we all should hope to preserve. This new technology is making our world and lives better and more interesting.

## 4

### SMART CITIES

**T**here is an argument that many of the problems in our modern world come from technology. Whether it is major challenges such as wars and conflicts, or personal problems like Internet addiction, technology is frequently blamed for escalating, exacerbating or even creating new problems.

In the early 1800s, a group of textile artisans in industrializing England saw the advancing of technology – mechanical looms and other textile automation – and worried about the effect it would have on their jobs and their future. It was thought – correctly, as it turned out – that the machines would replace the skilled artisans with cheaper, unskilled labor. And, even then, the writing was on the wall -- that the machines would one day replace the workers entirely.

These people roamed across the English moors to get to the textile factories and then smash the machines which they saw as a threat to their way of life. Yet it was in vain. Technology advanced. They were replaced. History tells this sad story as a cautionary tale that you cannot stop progress, even with violent, radical means. People who reject modern technology are still sometimes referred to as Luddites, the name given to the followers of that radical labor movement in the 1800s, probably named for their leader, Ned Ludd.

Today we talk about the Luddite Fallacy as well, that technology will create unemployment. While it does result in the loss of some jobs, the fallacy confirms, it also creates new jobs that, in many cases, never before existed. In fact, the productivity gains and benefits turn out to be far greater for society, although individuals may suffer. Computers displaced typewriters, resulting in lost jobs in typewriter production, sales and repair, but begat computer assemblers, network administrators, and programmers. And while a million monkeys on a million typewriters might eventually have duplicated a work of Shakespeare, they would have never created Microsoft Word.

For what it is worth, I believe in the transformative power of technology. My own life has been changed by it many times, and will be changed by

it again. Therefore embracing technology rather than rejecting it is part of my approach to a lifestyle of health and urban sustainability. This chapter is concerned with where we need to use technology most, in smart cities, and what technologies are going to be most influential on our lives in the following decades. This includes technology's use of information, such as in databases, to give us ideas like Quantified Self and *big data*. It also includes physical hardware such as 3D printers combining with software to design and print new objects just for you.

Having a lifestyle of urban sustainability means, of course, city living as opposed to suburban living. We've had major urban centers for centuries. What is different now? We need to learn to live smarter in the cities by using technology.

### **SMART CITIES**

To start, why *not* live in the suburbs? What is wrong with that, you might ask? Of course there is nothing inherently wrong, it is just a lifestyle choice. There is a more important question that will have to be answered sooner or later as our global population continues to increase to its projected peak of 9.6 billion in 2050: Is suburban living sustainable?

While many dream of living in the countryside on idyllic farms and in cottages, this is more fantasy than reality for the majority of people. The idea of being completely self-sufficient, supporting ourselves and family *off the grid*, is even more unrealistic. This option might be open to the wealthy, who can separate themselves from the rest of society by living on a large farm with independent clean energy, growing fresh food and stockpiling other supplies, but it is hardly a potential solution for our planet's billions of people.

From a materials and energy perspective, a suburban society that includes individual car ownership with people living far from where they work, commuting from minutes up to hours, is going to be hard to sustain. While the United States and other developed countries have largely chosen this lifestyle choice, the next billion people to reach middle-income status may not do so as easily.

We have finally begun to ask the question of whether they should even do so at all.

The suburbanization of many cities has resulted in empty inner cores at night and weekends. Other problems include inner city crime, income disparity, and difficulties delivering social services such

## LOHAUS

as education and healthcare over highly dispersed suburban populations.

There is also the opposite question. If everyone lives in the cities we have today, won't it be crowded, polluted, and still have the same income disparities, just in a more condensed area? Where is the happy medium?

As it turns out, I've experienced all three possibilities. I have lived in a suburban environment, in a dense urban environment, and in a few places that seem to have found the right balance and are the makings of smart cities of the future.

From what I recall of my suburban existence growing up in mid-sized Canadian city, Victoria, British Columbia, there were areas where there seemed to be few people around. Empty is one word to describe those areas, yet they were not empty at all, the houses had people, they just rarely came out. Neighbors were geographically close, and yet so far away in terms of interaction with one another. And we lived next door to a small farm at one point. It was nice but I rarely saw the farmer or his family. With the city being somewhat spread out, you had to own your own car. Our family, like most, had multiple cars. As kids grew up, a one-car-one-person ratio became

common among my friends. On balance, it was a nice way to grow up, all things considered.

I've also lived in downtown cores or large cities such as Chicago. The apartment building I lived in was located in what some would call the inner city, where I hardly felt safe at night because the streets were dark and nearly deserted except for the odd homeless vagrant. Stores closed, people left the offices and went home to the suburbs. What was convenient and vibrant during the day became still and inconvenient at night. On the positive side, I didn't need a car as work and home were within walking distance, but if I needed anything else, I had to ask my friend for a lift or take a taxi as the distances were too far to places like stores.

And finally, I have lived in modern Asian cities, such as Nagoya, Japan, and now live in Shanghai – cities that have mixed zoning, resulting in vibrant downtowns -- both during the day and night. Not to mention convenience. Whenever I want something, it isn't far, nor do I need a car to go get it. Walking is fine, a bicycle is better for long distances, and public transportation and taxis fill the gaps where needed. In 15 years living in those two cities, I have never needed to own a car. Finally, and though this is not true of every big city,



I feel safe walking alone late at night almost anywhere in the city.

I'm convinced that urban living is the only way that the next billion people are going to increase the quality of their lives without exceeding the limits of our natural resources. The cities of yesterday were built with the societies of yesterday in mind. New cities need a new plan.



There are some policies in Shanghai and other large Chinese cities that I think should be implemented everywhere, inside China and outside as well. I call Shanghai a smart city, but the definition of what makes a city “smart” varies. Smart could refer to practices from transportation to energy to education, but in general the underlying feature of all of those things is technology.

Smart cities, for example, should have a complex transportation network of public transportation, including underground and above-ground rail, trams, high-capacity buses, and on-demand travel options that include bicycles and cars available for instant rental via smartcard or online booking. I see such systems already coming into use in cities nearby Shanghai, such as Nanjing and Changzhou.

Nanjing, for example, is creating the world's largest bike-sharing program, with 100,000 bikes. You can use a smartcard to check out and return bicycles from 3,000 stations throughout the city. Changzhou has designed its new roads with a huge central tram system. Shanghai and Beijing, as described earlier, have world-class subway networks that will soon be the biggest in the world in virtually every metric: kilometers of lines, number of stations, and number of passengers. They are even most likely to be the cheapest to ride.

Today I see cities elsewhere applying these systems in an ad hoc and often ineffective way, as they struggle to overlay a new way of moving people in a city that has become set in its traditional infrastructure. Changing behavior of people is a major challenge. Cities that have existed for decades without subways are not the ideal places for installing them. Opposition of residents, difficulties and costs of construction, all are major obstacles. But then the biggest obstacle of all, once a city gets its first underground line, is getting people to actually use it. It might not be embraced by a populace used to driving their own cars or using other transportation. A subway seems somehow a step down, literally and figuratively, when people have gotten used to the rela-

tive luxury of their own vehicles or, at least, above-ground transportation.



Once you have a smart city with smart transportation options, it is up to the residents to use them.

As a practitioner of a lifestyle of health and urban sustainability, you can change your own behavior first. This can involve *how* you get from place to place, as well as altering *where* you are going, both in a physical sense as well as in a metaphorical way, as we shall see.

## **TRANSPORTATION**

Sustainability decisions about transportation include short-, medium-, and long-distance solutions. Let's look at each of these in turn.

### *Short-distance travel*

For short distances of, say, a few hundred meters up to two or three kilometers (less than two miles), why not switch from whatever you are using now – car, bus, taxi, bicycle – to an alternative form of transport that use no electric or fossil fuel energy? In other words, just walk! Or, if the weather is good, you can be like one of my friends, who *runs* from place to place. It doesn't

look that good to show up hot and sweating in rumpled business clothes of course, so this habit may require changes to your clothing as well, such as dressing in lighter materials or carrying around a set of more formal yet non-wrinkling clothing to change into at the office.

I mention walking first and foremost because it is actually one of the most overlooked and yet best forms of personal transport. Our bodies were literally evolved for it. However, as a modern form of transport, walking comes and goes as a trend. It is currently enjoying a resurgence, thanks to step counters such as the Xiaomi step counter and the Jawbone UP, which encourage people to set targets and walk a certain distance every day for health reasons.

Walking has been shown to be one of the best forms of exercise: low-impact both on your joints, and on the environment. Walking uses major muscle groups in your legs to burn calories. No need to go to the gym to run on a treadmill for 20 minutes, just walk to work and you will get much of the same benefits.

A solution for distances from a few kilometers up to perhaps 15 kilometers (about nine miles) is the use of a bicycle, Rollerblades, wheeled self-propelled scooters, or powered e-bikes. These re-

duce travel time significantly and are mechanically more efficient as you coast along, allowing your body to conserve its own energy more. The main drawback is storage at your place of origin and destination. Small collapsible bicycles and newer single-wheeled self-balancing transport exist, but some people find it difficult to carry these larger items on the subway, especially during rush hour. The general rule should be to show consideration for others, but I believe that more subway systems should make allowances for passengers to carry their transport rather than banning them, as some systems now do.

### *Medium-distance travel*

There is some overlap in distance between what is considered short- and medium-distance travel, where you could reasonably travel in a variety of ways. It's a personal choice at that point, but I always opt for the method of travel that gives me additional benefits needed at the time. If I am under a deadline, or need to arrive looking cool and professional, I will prefer the subway over biking, for example, because it is generally reliable and comfortable. If I want exercise, I might opt to walk a distance of five kilometers (three miles) or more. I make these choices daily as my needs change, rather than trying to stick to a commitment such as always using a bicycle. Over medium

distances, subways are my default choice wherever I go in the world.

Within many Chinese cities, excellent subway networks can now be found that allow you to travel around town without worrying much about traffic. They may get crowded at rush hour, but they are usually much cheaper and faster than other forms of transportation within the city. I think that the time saved is even more valuable than the money saved. Who wants to spend an hour or more a day in their car or a taxi just driving or, worse, stuck in a traffic jam? That said, if the physical distance is not great and the travel time is roughly equal, I actually prefer to walk for the added benefit of exercise and the fact that it costs nothing in monetary terms.

China's urbanization strategy has included the building of good metro networks in almost every major city, despite the model being financially questionable. In other words, those cities often spend vast amounts of money on building a system from scratch. It's a *Field of Dreams* sort of logic: If you build it, they will ride. Well, with the exception of Hong Kong, which has a privatized metro system that actually turns a profit, the urban rail networks in China are all losing money. However, at the same time, they each have a huge ridership. Shanghai's network can see up to seven

## LOHAUS

million a day, putting it in the realm of the world's biggest metro networks in term of ridership.

It is unfortunate that the subway, rail and tram systems in many cities around the world actually lose money and must be subsidized by the city or national government. As such, you might consider them as a form of community benefit that is wasted if the local population does not use them. For the moment, China's networks almost all fall into this category as well, but it is my impression that ridership is much higher here than elsewhere, especially in places where private car ownership has been the norm for decades. People don't want to switch to mass transit if they have gotten used to individual vehicles. China is at the inflection point. On the one hand, private car ownership can continue growing and we will literally have a transportation calamity in terms of traffic, parking, fuel usage and pollution. On the other hand, if people start using those world-class metro networks being built all around the country, there is the possibility that China can lead the world in sustainable mass transit.

So, wherever possible, at LOHAUS we try to encourage the use the subway network to get from point A to point B. LOHAUS is located between two stations on two different lines, making it con-

venient to get to from most points in the network. In fact, Shanghai's and Beijing's subway networks are among the newest, fastest and largest in the world. In cities like Guangzhou, travel to nearby towns such as Foshan, which used to take several hours, can be made by a subway that can take you there in under an hour. In all, nearly 40 cities in China have already built or are building networks at a rapid pace. If all goes as planned, China will be the world's biggest user of metro rail systems by a wide margin. It would be a shame if they will not utilized to their full potential, keeping pollution down and cars off the road.

### *Long-distance transport*

While it is possible to travel long distances on the metro, for example in Beijing 88 kilometers (54 miles) the longest journey at present, and at only 3 RMB it's a great deal. However, the time to travel that distance, with all the stops and transfers, is excessive. If you have to travel longer distances, therefore, both within the big city and further around the country and abroad, use methods that are even less energy-intensive than subways such as long-distance buses, high-speed rail and shared cars.

For long-distance travel over thousands of kilometers and across oceans, airplanes are really the



only reasonable way to travel. However, airplane travel over shorter distances is very carbon intensive. So if you have a choice of high-speed rail connecting where you are to where you want to go, this is a much more efficient way to travel. In China, where airplane delays and cancellations have become commonplace in recent years, it is far more reliable to use high-speed rail to get to where you want to be on time. China has the world's longest network of high-speed rail tracks, and the highest average speed for such tracks. It tends to be cheaper over short distances than air travel, and when you include the time that it might take you to go to an airport, check in, get to the gate, wait, fly and then repeat the process on landing, high-speed rail is actually just as fast or faster than planes over many routes.

If no other option exists, taking a bus is still a better choice than many other forms of travel because it is at least a shared transportation method over medium distances where subways or trains are not available.



Good transportation is one thing that characterizes a smart city. Plentiful and reliable energy to supply the city is another. Some cities grow and then run into resource constraints, such as not enough electricity, or too many cars requiring too

much gas, resulting in high prices for fuel, and pollution in the air.

Smart cities need a smart electric grid. Traditional electric grids are based on assumptions about consumption patterns. People used less energy during the day as they went to work, and energy use peaked in the mid- to late-afternoon as people got home from work, and started turning on heating or air conditioning and so on.

Problems with supply factors also limit the usefulness of our traditional grids. Power is often supplied by thermal generation plants that burn fossil fuels and continue burning even in the dead of night, although at a lower intensity, than in the day because shutting them down and starting them up was an energy-intensive process that took time. These systems entail a lot of waste, which is why many suppliers offer multi-tiered metering to offer cheaper power during off-peak periods.

Newer clean energy solutions actually make the problem worse in some ways. Solar power, for example, means that power can be more available in the mornings and afternoon when the sun is overhead. Wind energy is available any time the wind is sufficiently strong enough, but this might be at 4 a.m., when not many people need it. Cop-

ing with this unstable supply is becoming more and more of a challenge for the existing electric grids.

The problem of *too much* clean energy is actually starting to be a problem in some places. If clean energy is so plentiful as to cover as much as or more than needs of the residents, this raising the question of why utilities should be generating power at all. This could happen in places where significant amounts of solar panels have been installed and sunlight intensity is high, for example in Hawaii. There the amount of solar panel power is starting to overwhelm the grid circuits.

One solution to this is distributed energy generation, in the form of smaller power stations closer to the place where it is needed. Sometimes called micro-grids or smart-grids, these could connect new solar and wind farms, for example, with existing hydropower solutions, for a 100% clean *and* reliable energy network.

Another solution is home-scale battery systems, which are popular in Germany, or utility-scale battery systems attached to clean energy projects, which both act to store power when it is generated and release it only when it is needed.

JASON INCH

These are just some of the things that need to happen for cities to become smarter and self-powered by smart-grids of clean electricity.

## THE END OF WORK?

**A**n important LOHAUS principle is working in tune with both the New Economy as well as the principles of urban sustainability. How to do this involves changing our thinking about what work is, why we work a certain way, and what work we do.



### THE NATURE OF WORK

Our modern and seemingly natural work style was created, in many ways, to serve the needs of industrialisation. Forty-hour work weeks, five days on, two days off, eight- or nine-hour days, retirement at 65 (or 60 in the case of China), three square meals.

All of this would seem extremely odd to a person born in the Middle Ages. Weekends and holidays were almost unheard of. Rather, you worked while there was light to work by. Life expectancy was much shorter, so retirement was not a concept. One or two meals a day were more the norm, and so on. Not that you or I would want to live in the Middle Ages or earlier, of course, with their unsanitary conditions, rampant plagues, famines and religious wars, not to mention lack of modern conveniences like electricity and telecommunications.

The nature of work started to change with the transformations of agrarian economies into industrial ones, starting around the 18th century in Western Europe. In an industrial economy, maximizing the productivity of the *machines* is the imperative, not the needs of the workers. This changed the way humans worked, no longer on a human scale but instead in support of the machine scale. Having the machines running as much as possible, 24 hours day, made it necessary to have multiple shifts of workers. Math and human limitations made eight hours (three shifts in a day), 12 hours (two shifts in a day) and 16 hours (one long shift with no night shift) the most common. It was the norm to work for long hours, with no days off except perhaps for religious holidays, or one day a week to rest.

## LOHAUS

It wasn't long before working at this machine-scale became a source of animosity for the workers.

A number of labor initiatives, such as the eight-hour day campaign, started in the 1800s, consisting of a structured day made of up eight hours of work, eight hours of leisure, and eight hours of rest. While this corresponded to the needs of workers, it was resisted by industry, which wanted to maximize working hours and minimize pay. However, the human scale started to win out, and most European countries had adopted a standardized eight-hour work day by the late 1800s or early 1900s.

In the United States, it wasn't until 1914 when Henry Ford's adjustment of the schedules of his workers to eight-hour days, five days a week, that things started to change. Ford's adoption of the reduced working hours, even as he increased wages to a then-unheard-of \$5 a day, actually increased productivity, worker retention, and even sales and profits. It turns out that the improvements in worker focus, happiness and spending power all contributed to better performance of the company. Workers could actually afford to buy the cars they made. They had the leisure time to enjoy them. Within two years of making the change, Ford's profit margins had doubled with

the greater productivity and sales. American industry realized that exploiting workers would not necessarily lead to higher profits.

A system based on maximizing human working time is good for manufacturing and machines, which need a constant, stable pace without mistakes to work most efficiently. Such a system doesn't necessarily relate to how the people themselves would prefer to work. This is especially true in the creative New Economy.

People, unlike machines, work on the basis of rhythms. The circadian rhythm, your body clock, works on 24-hour cycle nearly identical to the period of the Earth's rotation. We also are affected by rhythms both longer and shorter than the circadian rhythm. Seasons change, each with its own characteristics, yet repeating every year with the Earth's revolution around the Sun. And there are shorter rhythms, such as how your sleep goes through phases every 90 to 120 minutes. The rhythm of your heartbeat may be faster or slower depending on your level of activity.

So which is right? Should we be working the way our grandparents and great-grandparents worked, a system that was created for a time when most of them worked on farms, in mines, or on factory floors? Some of us may still work in those envi-



ronments and find utility and efficiency in following the industrial approach, but the reality is that we are now entering the post-industrial age. We are in the knowledge economy. The combination of post-industrialization with the knowledge economy is what I call, in short, the New Economy. While much is still produced by hand, especially in developing countries, we are also moving toward a post-consumer age where the products and lifestyles that served previous generations are not those of our modern society.

### **THE NEW WAYS OF WORK**

While there are still factories and shift work today, many new jobs no longer work at the industrial pace of eight hours a day per worker.

Software developers are a perfect example. The process of developing software is impossible to do in a linear way that you would use for a manufactured product. Depending on the functionality needed, the computer language chosen, the necessity of graphics and other elements, any given project can be estimated, but rarely with 100% accuracy. Software bugs may take seconds or hours to diagnose. So the work of a computer programmer occurs in blocks of time. When they work on a given task, it might take minutes or hours. Therefore, it makes more sense to think of

the cycle of working as a process of ebbs and flows, ups and downs. In this way, it makes more sense not only to think about time as a linear progression, which in the traditional sense of course it is, and instead think about time as discrete blocks in which you may be working, relaxing, eating, sleeping or in some other activity. Each day can be filled with many non-contiguous blocks, so much so that it makes more sense to forget about a standard eight hour workday. Instead start thinking about your energy and focus. Rather than *how much* time you are spending, think about *the quality* of the time you are spending.

### *Managing Your Energy*

Living a lifestyle of health and urban sustainability means taking full control of how we think, how we work, and how we relate to others. Nothing else will do. It is remarkable how much people today have let themselves be controlled by thoughts like, "I'm too busy." and "I don't have a choice." and "I don't have any time." and so on. We've tuned out others, even our own inner voices, as a result of our increasingly manic and divided attention. Urban life is especially fraught with distractions that will upset our emotional, physical and chronological energy. The purpose of this section of the book is to help you take back

## LOHAUS

control of these three areas so that you can make bigger impacts on the health and urban sustainability of your life, as well as make a positive impact on those of others.

In our lives, we need to deal with emotional as well as rational issues, we may be well rested or we may be sick, and we may have a full plate of tasks or none at all. This forms the three kinds of energy that we must balance in our everyday life: Emotional, physical and the traditional time energy.

The first is what I call your emotional energy. The emotional or rational content of our thoughts has a strong effect on our psychological functionality. This functionality can and should be managed. While some people can exist in a rational mindset and be very analytical about everything in their lives, others have difficulty working while they are emotionally upset or distracted. Relationships with others, and the quality of those relationships, are part of managing this kind of energy. Negative people around you bring negative emotional energy.

The key idea is that we must be happy, in whatever way makes us personally happy. Some people spend a lifetime trying to achieve this state, but I think the process can be summed up in three

steps: Be happy with what you are, what you have and who you are with. If you are still unhappy, then change one or more of those things. Repeat.

The second kind of energy is related to our body's physiological state. I call it physical energy. Our physical energy relates to a number of factors, including the amount of rest we have had, the amount and quality of calories and other nutrients we have consumed, and the condition of our body's health, in terms of chronic and acute illness and injury. All of these things will affect our ability to function effectively.

Managing our health is covered in any number of other books, but the key idea is that we must be healthy to be able to succeed in a LOHAUS life. Or, another way of looking at it is to ask, "What good is happiness and success if you don't have the health to enjoy it?" Or, more dramatically, you can't take your wealth and success with you when you die, so you should focus on quality of life rather than the quantity of money or success you have.

Finally, what I call your time energy is a reflection of your chronological resources. It is not meant to express the idea that some people have more time than others, though some indeed may live longer than you. It is that some people are better at

managing their time than others are. The amount of tasks we have to do, whether we are multitasking or single-tasking, and the number of options we are pursuing simultaneously, all affect our time energy. You increase your time energy by clearing blocks of time, either by completing tasks or deleting tasks. You reduce your time energy by filling up your schedule with too many unimportant activities. To be sure, they seem important, but the key to managing time energy is to first understand its finiteness. Second is to understand what is important, indeed most important, to you, and be able to focus on that. Doing nothing also, in fact, depletes your time energy as this time has been wasted. Increasing your time energy means filling your attention with things that you want to be doing, whether that is working, enjoying life with your family, traveling or something else.

One thing that can sap our time energy is too many open decisions. Open decisions are like the open loops employed by actors to build suspense or curiosity in the audience. The audience pays attention when the actor says, "You wouldn't believe what happened next!" You are on the edge of your seat. Your focus is on that actor's next words. But, if it's a cliff-hanger, you may be left with a feeling not of anticipation but of anxiousness. *What is going to happen? What will be the ef-*

*fect on me?* In addition to usurping your time energy by focusing on something that has not yet happened and might not, open decisions act in the same way on your conscious and subconscious emotional balance. If you need to make a decision, it will be there in the back of your mind until it is made, blocking and distracting you from further thought.

Too many such decisions left open and you begin to lose the ability to focus. So, decide things! And then move on. Too many times, however, we are often waiting. Waiting for others to decide, waiting for information we think we need, waiting for the right time, and so on. The time is now. I like to paraphrase the popular U.S. political quotation: *If not now, then when? If not you, then who?*

Finally, beware the time energy trap of listening to and following the desires of *other* people. We find that many decisions in life are like this: Other people's priorities become our priorities. We have a culture now of Internet-capable mobile phones and wireless tablet computers that make us pretty much available anytime anywhere. So when people call us or send us an email or instant message with something that they need, it immediately jumps to the top of our priority list by fiat – we are the one they are talking to right now, or their email is the latest to pop into our inbox and is at

## LOHAUS

the top of the list, or their instant message or chat is pinging for our immediate attention.

The way to avoid this particular problem is to realize that those peoples' priorities are their own. They may be sometimes aligned with yours; or they may not be. You have to have the time to figure that out and then act accordingly. It may sound harsh but the world would be a better place if we all minded our own business first.

### *Never Retire*

I was in Singapore a number of years ago on a work assignment and I had some time free one evening to go for a walk with a friend. We were just leaving the hotel when a car pulled up and all the hotel staff came running out just as we were just outside the front doors. Surrounded and unable to get through without being rude, we waited for the crowd to disperse. Instead, it parted somewhat and I was face to face with the founding father of modern Singapore. I wish I had the forethought to carry one of my books that day to give to him, but I settled for his nod and a smile as I too-loudly whispered to my friend, "That's Lee Kuan Yew!" Then the security staff of the Minister Mentor, as he was then known, parted us to allow the elder statesman to walk through.

I'd studied Singapore extensively throughout my undergraduate degree in Pacific Asian Studies, so the former Prime Minister was more than familiar to me. I respected his political and geopolitical awareness that allowed Singapore, a tiny city-state with virtually no natural resources, a small population and a subject of the British Commonwealth, to become one of the world's richest countries on a per person basis in just over half a century of independence.

As Minister Mentor Lee proceeded toward the hotel, I was surprised at how frail he appeared. Not the young politician from my Asian history texts but a senior citizen of more than 80 years. And so I was all the more surprised when, a couple of months later, I was reading an article on some proposed change in Singapore's retirement policies in which the Minister Mentor was quoted as saying, "Never retire."

Some took his comments to be a callous response to the social concerns about quality of life after retirement. *Easy for him to say never retire, his son is still Prime Minister*, as it were. Even so, there was more depth to his comment than those two words. And clearly Lee remained active in politics at least until his official retirement from the position of Minister Mentor in 2011. I have a feeling



he is still working on *something*, however, and that he is following his own advice.

At the time, Lee Kuan Yew's commentary on retirement harkened back to the words of no less than a Nobel Laureate, the co-discoverer of DNA James Watson, who was quoted by long-time journalist and word maven William Safire in his final column for the New York Times. He quoted Watson as saying, "Never retire. Your brain needs exercise or it will atrophy."

So there is, in those words from at least two distinguished people and undoubtedly many more, something of value. Those ideas form one more aspect of what I think it means to be a citizen in the New Economy of a Life of Health and Urban Sustainability: Never retire.

At first, this idea will seem to be counter to what many hold dear. The idea that one day they can stop working, finally. Some people work hard all their lives in order to enjoy a pleasurable retirement full of relaxation and travel and freedom. Depending on which country they live, the legal retirement age might be 65, 60 or some other age. The problem is, our world just a few decades from now will not be able to support so many retired people. The hard truth is that most of the people who are young and working today will only be

chasing a dream of retirement that precious few shall achieve.

First of all, to take the United States as an example, the idea of mandatory retirement at 65 or some other age is myth that is perpetuated, seemingly, by popular mass delusion. In fact, the age of 65 or 60 or whatever age is simply used to designate the age at which people can start collecting social security benefits by law. While many countries do have laws which might mandate forced retirement from any number of official government positions, such as military, police and fire-fighters where perhaps safety is a concern, most of the laws actually had more to do with when people could collect benefits than they did forcing people to retire. For those countries that did have such retirement laws at some point, today most have already revised or are in the process of changing them.

The reality, therefore, is that the majority of companies and positions today do not have mandatory retirement. As long as you are able to do the job and want to keep working, in the U.S., the UK and elsewhere, most companies will not legally be able to force you to retire. These laws, if they existed in the first place, are being changed for two main reasons.

## LOHAUS

The first is because of age discrimination. There is an argument to be made that retirement is in order to make room for those at the bottom. Fair enough, everyone wants their turn to move up the ladder, their shot to be the top dog. Except if you are the one being kicked out from the middle or top and you feel you still have something to contribute. Many lawsuits against employers have resulted from people feeling exactly that way.

A second reason is that people are working past retirement by choice or by necessity is demographics. Pension systems around the world are under-funded and may collapse within our lifetimes unless the age for benefits is increased. A second aspect to demographics is that, in order to remain competitive globally, some developed economies, especially ones that experienced a strong post-World War II baby-boom, are now facing labor shortages in low-skilled service positions. The message in those countries is that seniors can *and should* keep working if they are able and willing, for the good of the economy, just in a position that pays minimum wage.

The idea that we must retire in order to get benefits is also no longer true in many places. While private companies might have pensions that begin upon retirement, when it comes to many

government benefits, you get them regardless of whether you are working or not.

While the retirement regulations of every country are different, the general trend is that retirement for skilled workers is being discouraged, and retirement ages are being moved upwards. There are several reasons for the upward revisions.

First, the original and seemingly arbitrary ages for retirement are, in fact, not arbitrary at all. They are simply anachronistic holdovers from the industrial age, when life expectancies were much shorter. Today in the United States, average life expectancy for males is 77 and for females 82. In many other countries, including Japan and Lew Kuan Yew's "Never retire" Singapore, men live on average to 82 and women to 87. In the U.S., one hundred years ago, around the time when Henry Ford was just starting to experiment with increasing wages and decreasing hours, men lived to just over 50 and women only 53 on average. Just by being born today in the U.S., you are living decades longer than your forefathers. In other words, people didn't really need to worry about retirement at 65, a standard that was being set as early as the late 1880s in Germany and in the 1930s in the U.S., because they were all expected to die much sooner.

## LOHAUS

### *Rather, we are all living longer*

It used to be that, if you were lucky, you'd live until 70, 80 or even 90. Centenarians were once so rare in the United States that they could all have their 100th birthdays announced on television. Today, they are too numerous to list except on a scrolling list or on a website.

Improved health care has been the biggest factor. New pharmaceutical innovations for blood pressure, treatments for chronic illness, replacement joints, as well as all-round better access to medical care, have made us all much more likely to live years, even decades longer than our parents' and grandparents' generations. As long as we have the money to pay, of course, or live in a country with universal health care and quality hospitals and services. For younger workers today, it is ironic that poor diets may actually cause them to live shorter lives than their parents and grandparents, who can afford the healthcare and are covered by seniors medical benefits.

### *Retirement funds are on the verge of collapse*

It's simple math that, in most countries with large retirement funds and a slowing birthrate, the demographic pyramid is increasingly top-heavy. And until relatively recently, retirement was, statisti-

cally, rarely more than a few years, during which the government or the company you had worked for all your life, or a combination of both, could easily manage from the collective past contributions to a retirement fund. With longer lives from better health care, we are collectively starting to break the bank of the traditional retirement systems.

In China, retirement age for men is 60 and for women it is as young as 50 if you worked in a state-owned enterprise, 55 years old otherwise. Today in China's urban environments, people are living much longer than their rural counterparts. This is causing similar problems for China's pension system and other social benefits. China will soon have the world's largest cohort of senior citizens, more than 200 million. And with urbanization only approaching 50 percent of the population, there are still many more people who will move to cities and subsequently receive better health care and live longer. It's quite a dilemma. How did we get here, and how will we get past this challenge?

*It's all about the birthrate*

When economies are developing, and in the stage leading up to transition from agricultural to industrial and rural to urbanized, families with more

## LOHAUS

children generally mean more affluence and more security for the parents. In agricultural economies, which included China just 30 years ago, people tend to have more children in order to help out with the labor-intensive farm work. Before the One-Child Policy was enacted in China, families were much bigger.

Similarly, most governments of such economies could not provide a secure retirement because the agricultural nature of the economy made collecting and managing taxes difficult. The government got paid in grain, and people were left to fend for themselves with perhaps a meager retirement stipend. As a result, having several children would likely provide a more secure life for the elderly once they were no longer able to work. This generally meant until they physically could no longer work. They were still expected to contribute to family life by looking after children, cooking meals and so on. The children *were* the retirement fund.

In addition, having several children is a type of insurance against the loss of a child due to accident or illness. Hospitals and medical care were hard to find in rural areas, and not especially good. Infant mortality tended to be high. This, and other metrics of health, became the focus of organizations such as the United Nations, the

World Bank and the World Health Organization. Before infant mortality rates were decreased, families in agricultural, rural economies tended to have more children on average than people in industrial, urban economies.

This created a population pyramid where the people at the young base of the pyramid were more numerous, and the relatively shorter life expectancies meant that, within a couple of decades, the pyramid was narrow at the top, with a minority of senior citizens. Every couple tended to have more than the replacement rate of 2.1 children. So, when it came to issues like retirement of the relatively few surviving seniors, the base could support the top.

Three situations are possible. The first, if the situation described above continues, with subsequent generations having more than 2.1 children per couple, the base would remain stable. The shape would be that of a pyramid standing on its base, stronger and thicker the more children were born. The second, if they always have the so-called replacement rate of 2.1 children per couple, the base will be more like a rectangle. The third, and final shape, if couples have on average less than 2.1 children, the base gets narrower and narrower, and the overall shape starts to look like an invert-



## LOHAUS

ed pyramid. In inverted pyramid is inherently unstable.

Two trends have occurred now to change the population structure in many countries around the world, both developed and developing, into just such an unstable inverted pyramid.

The first trend is that people are having fewer children. There are many studies that confirm that development of an economy and a society tends to lead to a lower birthrate. Once affluence increases, people are less-worried about themselves in their retirement or about who'll take over the family farm, so they have fewer children. Education has also been shown to be inversely relational to birthrates. In other words, the more education the population receives, for women in particular, the fewer children they tend to have. Birth control awareness helps, as well as access to birth control products. Finally, urbanization has been shown to decrease birthrates as people, now living in an urban environment, find it more expensive and unnecessary to raise as many children as their rural ancestors did.

In China, in addition to the changing social preferences, there are official policies limiting the number of children, generally to one or two for the majority of the population. Commonly known

as the One-Child Policy, China actually mandated that people have fewer children, and demographers estimate this resulted in China's population today being several hundred million lower than it would have been otherwise.

The second trend changing demographic structures was mentioned above: people are living longer. Better health care is one reason people are living longer. Urbanization, with its better access to health care services, is another. Diet is possibly a third, with countries such as Japan pointing to their seafood-rich, low-fat diets as a reason for longevity. Changes in geriatric diets around the world are also important. As we become more aware of the importance of diet for longevity, we are eating better later in life. Although the inverse is also true, young people have never had higher obesity rates, the tide is turning. More people are becoming aware that eating right can lead to better quality of life, and longer life. People are starting to get healthy, exercising more, and eating better. All this is leading to longer lifespans, especially in urban areas of developed economies.

Lifestyle changes, such as less smoking, also have an impact on longevity, with the relationship between smoking and lung health never being clearer. Countries such as the United States and

## LOHAUS

Japan have decreased their rates of smoking to historic lows, which will have a long-term impact on deaths from lung cancer and tobacco-related illnesses.

So people today are having fewer children, and living much longer in general, leading to an increasingly top-heavy demographic pyramid. An intermediate step might look something like a flower vase with a still-stable base but flaring outwards at the top. The worst structure would be an inverted pyramid with there being many more people at the top, essentially squashing those at the bottom with demographic pressure.

*Is demographics really destiny?*

The expression “demographics is destiny” has much truth to it. Demographics are actually factual statistics – not projections. Because the statistics are based on everyone who has already been born, the inverted pyramid structures imply disaster. Their physical shapes are less stable than a wide-base pyramid, so we assume demographic disaster is about to ensue.

This fear shared by many is based on an outmoded way of thinking that young people are always more productive than the aged. In the agricultural era or industrialization of the modern economies

of today, this was quite possibly true: young people *could* work harder, *were* stronger and faster in general. As factory workers, generally the younger the better, so much so that most countries had to institute laws against child labor, the incentive to hire fast-working, easy-to-control, nimble youths was so great.

Today, a sea change is occurring, which many of the demographic doomsayers fail to mention: in the knowledge economy, age becomes increasingly irrelevant. In the New Economy, where principles of relationships and sharing are even more important, physical strength is even less necessary. So there is another answer. We will be OK, demographically speaking, so long as the top of the pyramid is productive at a similar or increasing rate compared with the bottom. Another way to put it might be old dogs had better keep learning new tricks, or else.

If the aging population creates new kinds of productivity, they will not need to be worried about whether their children can look after them in their retirement. It will create a new sort of working environment, however, which many at first will be loath to embrace, what I call the end of retirement.

## LOHAUS

Before I outline what this might look like, let me ask you one simple question: What are you going to do for ten, twenty years or longer of retirement? What are your plans? Sitting on a beach and relaxing for a decade? Traveling for 15 years? Helping to raise your grandchildren to adulthood? We all tend to imagine retirement as an idyllic time of rest and relaxation, but several realities are about to intrude on this and forthcoming generations.

### **THE END OF RETIREMENT**

Like Lee Kuan Yew and James Watson and many others, I have already made a conscious decision not to retire. It simplifies retirement planning immensely. I need only plan for life, not for life after retirement.

This idea actually precedes my formation of LOHAUS, as I have always believed that the idea of working at a job that you just tolerated, or even actively disliked, only so that you can one day finally quit to do what you really want to do, is backward. My additional problem with this way of thinking is that many people seem to aspire to no more than travel and relax in their retirement. While it is true that some people do pursue a productive retirement, perhaps writing or volunteering or devoting themselves to study, many more

seem to just disappear. Why not, I wondered, do what you want to do to enjoy life *now*, and work hard *later* once you had the experience and knowledge to contribute something meaningful?

Similarly, as a university instructor for over half a decade in China, I met too many young people, and some older ones in my MBA classes, whose entrepreneurial dream seems to be no more than to create a company, have it go public or be bought by a much larger firm, thereby enriching the original entrepreneurs to the extent that they never have to work again. That's about the worst reason I can think of to start a business. This is, nevertheless, the dream many people choose to follow.

The reality of retirement, I have observed, seems to be that many people, no matter whether they are seniors or younger entrepreneurs who made it big, retire for a year or two and then belatedly realize just how boring and empty their lives have become. Having quit, sold their companies, or committed to living in some kind of retirement haven, a home or an island, they find their lives are more than a bit empty.

That is why I prefer to look at role models like Bill Gates who, on retirement from Microsoft as the richest person in the world, has continued to work

## LOHAUS

on his other businesses, especially his Bill and Melinda Gates Foundation, to contribute to the world. He has even gone so far as committing to give away the vast majority of his fortune by the end of his life. Quite a job he has ahead of him.

“Youth is wasted on the young” is more than just an expression, it is a truism that few people are willing to admit. Society is, at present, structured to extract the greatest amount of physical productivity from its youth because that is what the agricultural and industrial eras historically needed. It is exactly the opposite of what the knowledge and creative New Economy requires. Instead, a new paradigm is needed.

### *Retirement is Dead, Long Live Retirement!*

Part of the LOHAUS approach to life is to retire multiple times. I’ve already done this twice in my life. I call these LOHAUS Sabbaticals, after the academic tradition of taking time off to study, research and refresh, teach or travel abroad and eventually return to continue work, better than before you left.

The LOHAUS Sabbatical will sound familiar to many already, it is just longer than you might be used to hearing about, months or years instead of the usual weeks. It won’t be an alien concept to

many, for in the last decade I've noticed that more and more people take detox trips, for example, where detox has nothing to do with the substance abuse problems of previous generations but is instead a body cleansing regimen, inside and out, through massage, eating clay and vegetable juices, enjoying (enjoying?) colonics and the like. This process is thought to remove certain toxins from urban life, pollutants and so forth, from the body. Another possibility is action vacations where the main activity is participating in a structured activity such as working on an organic farm or volunteering to build a house in an underprivileged community with Habitat for Humanity. Still others take meditation or study retreats, to focus on religion, philosophy, yoga or other passions. These are all well-and-good but they are designed as a temporary relief from our misery at best. I am talking about something deeper.

The Sabbatical is longer, better funded, and better planned due to its long-term nature. You might take a year or two off from work, or whatever it is you are doing now. During that time you could study something new. Or conversely, you might rejoin the workforce with a new career in order to learn the new skills you desire. You could completely start over by moving to a new place, remaking yourself and your career in the process. The only thing that keeps you from doing this is



## LOHAUS

usually fear – what will people think of me as a 50-year-old “new recruit” or “new arrival” or “new entrant”? How will I pay the bills? What if I can’t get my old job back?

Overcoming these fears means reframing your way of thinking.

During the time of the sabbatical from your current life, you will undoubtedly require funds and support, but not as much as you might think, as long as you are willing to let go of some anachronistic ideas. Most people, for example, think that moving forward in life, which a sabbatical is designed for, should be synonymous with *more*. More money, more status, more friends, otherwise why would you do it? For example, many believe that if you move to a new city, you should keep your home in your previous location, meanwhile buying a new home in the new city, and getting a better job with a higher position and salary. Most people would consider that as moving forward.

The problem with this idea is that it is not economically sustainable for everyone. It is not compatible with the reality of the New Economy and a globalized world. At present, there is a large wealth gap between the *haves* and the *have-nots*. The conventional wisdom is that the growing wealth of the world is good for everyone. A rising

tide lifts all boats, so the saying goes. Except not if your boat is moored to the dock. That is the reality that many developing economies are in today. Some of the boats, the haves, are unmoored and free to roam. The have-nots are bound to be swamped in the coming storm.

There is a moral argument that they deserve more. Try to make the same argument for the haves. They may want more. They're not going to get it as 1.3 billion Chinese, 1.2 billion Indians, 3 billion more from Southeast Asia, Africa and South America all emerge onto the global stage. It is almost certain life for them will get better. What is not so certain is that life for the haves today will continue to get better. More likely, we are all going to end up in the middle. This will mean changing your way of thinking if you are young and growing up in a developed economy today. Instead of a lot of people being a little more happy, and a few people being really happy, how about everyone just being happy? That is what I see in the future of the New Economy. But I imagine it is going to be a tough sell to the haves.

Selling a house in one place, if you even have a house, just to be able to afford a smaller house in a new city because you are taking a job that has less status and a lower salary than before – many today would consider this as a backward step. And

## LOHAUS

if your only metrics of success are the size of your house, your net worth and title on your business card, it is a backward step. But what if you redefine the metrics of success to what matters to you, and what matters to the New Economy? The goalposts can move if everyone agrees.

With LOHAUS and the New Economy, metrics of success include how many places in the world you have lived, how many cultures you understand, how many languages you speak, how many companies you have started or how many projects you have worked on, how many people you employ, and more fundamentally, your happiness and satisfaction in everything from health to family to life quality. But the key is also in defining metrics of success that matter to you, not that matter to society, especially the society of yesteryear.

### **HOW TO PLAN FOR THE LOHAUS SABBATICAL**

Financial planners might define your retirement goals in terms of how much money you need to save to maintain the same level of income today without working tomorrow, merely by living on your investment returns and government benefits. There is usually a cash buffer saved for as well, in addition to an implied need to cut your spending, in order to pay for some elective health procedure, a nip and a tuck, or a trip, now and then, *un-*

*til you pass away* based on the best actuarial understanding of your longevity. Not such a pleasant concept when you think about it. The period leading up to this retirement is one of economy, saving for the future, saving for your children's educations, saving for your future health care, saving for a rainy day. Well, the rainy day is here already, most people just don't realize it.

Life expectancy is actually still getting longer. It doesn't change quickly, but it is likely that the first people to live a healthy quality of life beyond age 120 have already been born, and might even include you. As more anti-aging drugs become available, more bone, joint and eventually organ replacements become feasible through 3D printing technologies, it is likely that we will all be living much longer than is the norm today. The main barrier today is not even our bodies, it is our minds. We have found ways to preserve the flesh through exercise, diet and medical care. But our brains are the least understood organs in the human body. While we have made progress on understanding brain health and plasticity, which is the ability to make new connections when we learn something new and store new memories, our biggest risks as we age are from brain-debilitating conditions such as Alzheimer's disease and other forms of dementia.

## LOHAUS

The most radical idea of all, living forever, is not impossible, either. One researcher, at least, Aubrey de Grey, talks of longevity escape velocity, the idea that if we can just live long enough until the next major breakthrough in anti-aging, perhaps a better heart replacement, then this will allow us to reach the next major breakthrough, perhaps a brain plasticity drug restoring brain function to that of youth, and so on, until eventually we have the technology and the means to live forever. He contends that the first person to live forever has already been born.

So, whether you believe in life extension, or even eternal life and a modern fountain of youth, the traditional concept of retirement will apply not much longer. I believe it should be done away with. I have already discarded it myself. I believe the last generation of retirees has already been born as future generations will find the idea of simply doing nothing other than sitting on a proverbial beach to be as antiquated as horse-drawn carriages are today.

That's why the LOHAUS concept of retirement is better described as a *mini-retirement* or, as I prefer, a sabbatical. It might happen every five years. It's all up to you. It is a much more sustainable approach to life, both for you and for society, as you remain an interested and engaged person

with things to do and a productive person from society's standpoint. It is characterized by self-learning, alternative learning, and creating new value.

*Work when you work*

If you are going to adopt a no-retirement lifestyle of health and urban sustainability, you should also plan to make some changes to the way you work. What's the point of going to a job you don't enjoy? Also, in order to prepare for your LOHAUS Sabbaticals, you will need to work effectively with a plan, and work doesn't *stop* during a sabbatical, it is just a different kind of work, hopefully one that you also enjoy. And, after the sabbatical is finished? More work! So if we have a new way of retiring, we also need a new way of working.



The key to work productivity is focus. Today's world has so many distractions, so many priorities, we often have lost the ability to be "in the moment," or mindful, as some describe it.

The way we work is actually constantly changing. It wasn't until the advent of computers, telecommunications and Internet anytime everywhere that we started thinking that busy is good. That

## LOHAUS

multitasking is better. That working all the time is best!

Single-tasking means focusing on one thing at a time. Multitasking means generally doing several things at the same time.

Compartmentalization is perhaps a better description, in that some people are better than others at dealing with the multiple energy levels and skills needed to rapidly switch between tasks, much like some computers do.

In the LOHAUS way of thinking, multitasking is least valuable, compartmentalization is better, but the real value comes from focusing. It is about the quality of your thinking and work, not the quantity. Focusing is about being able to slow down, narrow in, and disregard other non-important tasks. In order to do so, however, we have to learn again how to manage our multi-device world and the condition that is popularly known as information overload.

### *The New Tools of Work*

Society has changed the way we work, and tools such as computers, the mobile phone and Internet have made working in new ways possible, but not necessarily better. Not so long ago, in my early

college days, I would type assignments for school on an electronic typewriter. The typewriter may not even be familiar to today's young people, with its lack of a screen, mouse and, in some cases, even electricity. A mechanical typewriter was like today's wireless laptop – you could bring it with you wherever you went. It was heavy and inconvenient, yes, but not much more so than a large laptop today. But it had no function whatsoever other than typing documents and, if you lacked blank paper, it couldn't even do that.

The mobile phone is the evolution of the telephone and, before that, the telegraph, allowing people to communicate without being face-to-face. The idea of not carrying around a mobile phone would be familiar to many older adults today. We can also likely recall mobile phones being so large that they had to be carried in a briefcase or with a shoulder battery pack because the battery technology of the time was so different from today's. Pagers, radio-signaling devices that would let us know we had a message and had to call into the central dispatch or our voice mail system, were the bridge between traditional land-line phones and the mobile phones we have today. They have mostly gone the way of the mechanical typewriter – forgotten relics of another generation. Today our typical smartphone has



## LOHAUS

more computing power than the computer that the astronauts had on their trip to the moon.

The real game changer when it comes to technology, however, is the Internet. Its development, occurring in tandem with computers and mobile phones, has enabled a convergence of data, communications and computing. It is what allows us to be connected, anytime, anywhere, to practically every person and place on Earth, as well as giving us instant access to pretty much every piece of information or media ever created. A side effect is that the Internet now allows us to work on anything, wherever in time or place we happen to be.

While this has undoubtedly brought huge benefits to our global society, and surely the biggest benefits are yet to come, it has also brought with it a new way of work and living. These are still being defined, but are already changing once-common practices.

One example is how with previously non-connected work, we would be able to focus much more easily on a single task. There was simply none other to be done at that particular moment. A typewriter couldn't change documents without us physically removing a page, and manually inserting another page. We couldn't look at multi-

ple email subject lines at once; there were no emails. Our inbox was our mailbox. Possibly a tray on a desk with a rudimentary last-in-first-out built-in functionality. To multitask, we might have lined a bunch of envelopes on our desks and decided which would be opened first. At best we could have a set of paper memos laid out on a large desk to examine. If we were in an office thirty years ago, we had the basic tools to teleconference or take multiple calls in a queue, but our personal home phones could do no such thing. Today, we can be carrying on a video conference on our mobile phone while sitting on top of a mountain miles from any office, while using our computer, perhaps powered by a small solar-powered recharger.

I do not want to romanticize the past, any more than I would want to live in the Middle Ages, and I don't want to go back to a time without mobile phones and computers. These tools actually promise a better future, if we use them well. The key is that we must regain our focus. We need to pay attention to the most important tool of all: our brain.

### *Brain Health*

Work itself has changed. We now work in offices, most of us sitting, staring at a computer screen

## LOHAUS

for eight hours or more each day. In the pre-industrial world hundreds of years ago, it was about how hard or fast you could work. Productivity was limited until the industrial transformation of work, wherein the focus shifted to the machines supplementing or replacing human labor, increasing productivity as machines became bigger. Today the world is changing again. In an economy of plenty, the focus is not on how many people are working at a company, or how many machines a company has. It is how the workers use their knowledge to create, understand and manipulate information, increasing the amount of virtual work, moving bits around, to levels unimaginable just a few generations ago.

The health of our brain is a function of not just the nutrients we put into our bodies, or the education we fill our brain with, it is about the quality of thinking we do, whether at work or at play. I have already described how you should focus when you work. You should also, it turns out, focus when you play as well.

### *Play when you play*

The other half of mindfulness is that when you are not working, you must let go of work, and focus instead on something else, be it relaxation or play. Play -- isn't that just for children, you ask?

Well, if you asked a computer gamer, an adult, they might disagree. If you asked somebody who plays sports, they might disagree too. The form of play might be different, or more serious in some ways, but play is play.

The concept of serious play, or focused play, comes in many forms. One form is the academic variety, which has been around since the mid-1990s as a managerial learning concept that is now taught commercially to organizations around the world under various brands, the most famous being Lego Serious Play, where people learn to think creatively and solve problems using Lego blocks.

I think about serious play as more of a conceptual idea of play and focus. When you are playing, you need to be in the moment, full of passion about what you are doing and focused on it, rather than distractedly thinking about work-related issues or trying to think about the “return on investment” of what you are doing, as in say the case of lifting weights at the gym. How much weight do I have to lift to get the body I want, you might wonder while pumping iron. How about just enjoying it for enjoyment’s sake? And instead of pumping iron, why not climb a tree? Aside from the risk that you might fall and break your neck, it’s just a good exercise to lift your body weight, and many

## LOHAUS

times a lot more ergonomic to boot. In other words, our bodies were made for running on the ground, not on a treadmill. Our arms and upper bodies are great for climbing up a wall or a tree, rather than doing pull-ups on a bar.

Play has been shown to help revitalize and reenergize, if from nothing else than the physical activity. There is a huge difference when compared with how little energy is needed to sit at a desk in a chair and use the computer all day long, neck bent forward. Studies are adding up, showing that our sedentary lifestyle and office work are taking a toll on our backs and our blood circulation through stress hormones like cortisol which are released when we are under pressure, say from your manager at the door waiting for an assignment. Playing will allow your heart rate to go up and blood will flow to dormant muscles, literally waking up your body.

As a simple first step, getting up from work once an hour for a quick walk will do wonders for your focus and your posture. Making the walk a little more vigorous, by doing some physical exercise, and radically shifting your brain's focus, will do even more. Doing something creative, such as making something, manipulating objects, solving a simple puzzle, will sometimes take your mind completely off of whatever work it was you were

doing. And that's a good thing. Too much time focused on one task leads to diminishing returns.

Many of us have forgotten how to play. We sometimes need to study children in order to remember the unofficial playground rules.

First, don't worry about the activity or what others are thinking about you. As adults, we may be concerned about our image, our dignity. Like children we might be worried about being picked last for a team. Find approaches that prevent this from happening, such as random assignment of groups.

Second, play has no rules, or at least the rules are pretty flexible. When we were children, those of us who grew up in an era before computers, we would make up our own games, with our own rules. Hours could be devoted to a scenario that would be unique and probably never repeated again in exactly the same way because that would be boring. Children constantly vary the rules, or throw out the rulebook altogether. As adults, we exist in a society that is defined by rules, regulations, laws and processes. We have been conditioned to follow them for the sake of fitting in, respecting others and being a good citizen.

Third, when younger children play with others, they are mostly unaware of class, gender and age.

## LOHAUS

They play together for the sake of playing, not for the sake of whom they play with. As we get older, we start to change and even children may be well aware of being different from others. As adults, many are obsessed with the idea of status, appropriateness, and more rules and regulations with respect to who we should be with, what age is appropriate, political correctness, gender balance and a host of other issues that inhibit open and creative thinking. We need to find a way to go back to those earliest years where we played with others for the happiness of the activity.

Finally, to a child, anything can be a game as long as they use their imagination. A hoop and a stick can be all they need for a fun game. A ball can be used to play catch, but it can just as easily become an imaginary friend. As children with vivid imaginations, we all had the ability to take any object and make it into anything else we desired. We could create entire worlds and narratives to explain what we saw and experienced around us.

Yet as we get older, we often lose that ability to create, to use our imaginations, to think abstractly. Instead we repeat the same work over and over, we see things the way they are, and we think logically and literally.

Note I am not suggesting you go back to the *mind* of the child, merely the *mindset* of one. What does that mean other than the rules above?

Here's one more idea, a lesson from *Marcus Aurelius Antoninus Augustus*, better known simply as Marcus Aurelius, one of the Roman Emperors, who wrote, *festina lente*. Hurry slowly.

Children are not in any rush to finish their play, they wish it would never end. They might express this idea by running with joy to an activity so they can spend more time enjoying it. Or they might spend a whole afternoon building a fort, just for the happiness of imagining they are in one. And they will fight to the last second to stay at play, even when their parents are calling them to dinner. That's the value of play. It is worth fighting for.

As adults, we need to remember to stop and play. Become more mindful.

Hurry Slowly

Festina Lente.



In short, doing all of these things will help you to take back some control of your life. With an understanding of the new nature of work and re-



## LOHAUS

tirement, and a knowledge of time and energy, you will be able to balance your life and gain more time to do the things you want to do.

The key idea is that we must *have* time in order to do things. It's like the old adage, you have to spend money to make money. With time, you need to make time to spend time. Think about it

I would like to ask you to recall the story at the beginning of this chapter, from the early 1800s, of the then-radical idea of the eight hours work, eight hours relaxation, eight hours sleep movement. Before that time, and indeed for many decades following, it was the norm to work ten hours, twelve hours, or more, six or seven days a week. People lost their livelihoods and even their lives striking for better working conditions. Revolutions were fought over work, allowing our societies eventually to attain middle class comfort and enjoyment during some of the 20th century.

At the dawn of the 21st century, we are in the midst of a silent revolution to take back the freedom and pleasures that have been lost. The nature of work changed with the Industrial Age. We are now entering, and in many ways already in, the Information Age and the New Economy. Work is changing again. Change with it, or be changed by it. Work is dead. Long live work.



## 6

### BIG DATA

People have been collecting data about themselves in a mechanical way for a long time. How many stones we weighed, how many hands tall we were, and so on. By adding the element of time, we measured how fast we ran, our heart rate, and our age. We can now add a step counter and a smart phone to begin automatically collecting information about our lives, such as how many steps it takes to get to where we go, how long it takes to get there, and our subsequent walking speed and approximations of calories burned. All of this can be measured and calculated automatically.

The things we can now *quantify*, from the so-called *Quantified Self* (QS) movement, are almost endless. Our sleep patterns, our weight and body composition, and more. This doesn't stop with

ourselves. We can measure our environment as well.

A more recent phenomenon is tracking not only your life, but what goes on around you, especially in that place where you likely spend more than half of your life: your home.

Including sleep time, the average person is going to spend 12 hours a day at home – even if you have a busy life and feel that you are hardly at home at all. On that basis, it makes sense to devote a fair amount of time to managing that place better. Fortunately, the QS movement gives us some new tools, which can be called the Quantified Home.

By tracking what goes on in your home, you will achieve a number of positive benefits. First, you will have a better awareness of things like the temperature, air quality, and other metrics that are important to a life of health and urban sustainability. Second, you will save energy, and money, by better managing your electricity, water, and gas use. Third, you will be able to take advantage of a number of new ideas and technologies that are only available if you make the decision to quantify your home. Let's look at each of these in turn.



## LOHAUS

It was 2012, just after I published my book *China's Economic Supertrends*, that I went on a weekend getaway organized by friends at Green Initiatives in Shanghai. The destination of the trip was the nearby town of Anji, in Zhejiang province. This city, about two hours from Shanghai, is famous for its bamboo forests and related industries, including bamboo construction materials and handheld fans. It's also a beautiful natural environment where many movies have been filmed, including scenes from *Crouching Tiger, Hidden Dragon*, with Chow Yun Fat and Zhang Ziyi flying through the bamboo forest.

The purpose of the trip was an exchange of ideas and sharing about sustainability.

One of the things that happened that weekend was a series of informational seminars that were among the first of their kind in China. They included a talk about how to measure pollution *inside* the home. The speaker had brought a specialized and expensive meter that could measure the quantities of Volatile Organic Compounds, VOCs, in the air.

Much to everyone's surprise, even an indoor room in a sustainable hotel in the middle of a bamboo agricultural zone contained some quantities of toxic pollutants. Much of those pollutants actually

came from things like fresh paint and new furniture that had been produced in factories but continued to seep chemicals into the air for weeks, even months after installation.

The only way to know about these pollutants, however, was to actually check the air quality levels with a device. And this device, at a cost of several thousand dollars, was unlikely to be purchased by many.

Until those become cheaper, I decided to look for and install devices in the LOHAUS building that would at least measure the temperature, and keep track of it throughout the day, as well as the level of CO<sub>2</sub>.

By measuring indoor temperature –with a standard thermometer or by setting a temperature on an air conditioner or thermostat – *and* outdoor temperature throughout the day, you will get a better sense of the air temperature *difference* between indoors and outdoors, showing heat loss and gain. More than just an indicator of comfort, this data can tell you how effectively insulated your home is, how fast it loses or gains heat. Using measurements throughout the building instead of just one central location can tell you where you need to install extra insulation. Insula-

tion is important in both winter, to keep your home warm, and summer, to keep your home cool.

Another measurement that is easy to take, but which most people don't think about much, indoors at least, is CO<sub>2</sub> content in the air. We've all heard of *An Inconvenient Truth* by now with its dramatic chart of CO<sub>2</sub> levels, measured in parts per million, growing rapidly. On a local building level, due to the respiration of its occupants, CO<sub>2</sub> levels can be much higher.

All living creatures need oxygen, and as our bodies exchange oxygen in the blood they expel CO<sub>2</sub> as a by-product. Over short periods of time, the amount of CO<sub>2</sub> in a room can build up, creating a feeling of stuffiness and discomfort. Some people will feel it as fatigue, others may get a headache. The low-tech solution is easy: open a window! But what if it is very hot or very cold outside, or outdoor pollution levels that day are especially high? You could turn on an air conditioner to draw in fresh air from the outside through a basic filter to get rid of the largest particles and use indoor air filtration to purify the air further. There's also a natural solution described in a previous chapter: indoor plants. However, without measuring the CO<sub>2</sub> levels, you might not even be aware of the problems low CO<sub>2</sub> is causing. Perhaps you are not sleeping well. It might be that your air circulation

at night is poor, causing you to feel drowsy too early and restless during the night as your body struggles with low oxygen levels in the room. Today, several devices for the home can automatically report indoor CO<sub>2</sub> levels, though only the most expensive of them are connected to the ventilation system to automatically circulate the air. You still have to do that manually in most cases. CO<sub>2</sub> is one pollutant you should monitor. There are many others.

Of course, one of the most dangerous pollutants in the home is carbon monoxide, CO. Caused by incomplete combustion, CO is toxic to air-breathing organisms. If not properly ventilated, it can kill. Every year there are many tragic stories of children, elderly, and even entire families, who go to sleep with an indoor combustion heater burning somewhere in the home and never wake again. Sometimes it is not a burner but simply a poorly installed hot water heater. Carbon monoxide detectors are actually inexpensive and can save lives. While not necessary to actively monitor them each day – ideally there should be no carbon monoxide in the home – it is important to check them from time to time to ensure they are still working.

Finally, in LOHAUS and in almost every residential building, you can find a number of built-in meters



that will help you to measure and monitor your carbon footprint and quality of life by the amount of electricity, water and gas you use, for example. Although they are built-in, sometimes they are in hard-to-reach places, and out-of-sight equals out-of-mind for most people. But it is important not to forget to regularly monitor our own use of these utilities. In addition to helping us understand our own resource use, monitoring them has another important benefit.

The next thing to look at is your utility bills, especially the monthly electricity bill. Your goal is to get at least one year of usage data so that you can compare year-over-year data, rather than month-over-month. Many bills actually tell you the increase or decrease of energy over previous months. This data is interesting but it is actually not very useful to making our homes and lifestyles more sustainable. The reason is that, due to the effect of the seasons, it is normal for our energy use to increase or decrease, sometimes quite dramatically. When it gets cold, we turn on the heaters. When it is warm, we turn them off. When it gets really hot, you turn on the air conditioner. Your refrigerator is going to use more or less energy depending on the temperature of the room it is in.

If you don't keep all your old bills, you can still call the electric company and get your historical data from them. Once you have a year of data, you can compare how much energy you are saving after making your home more sustainable.

An interesting thing that some power companies are now doing is telling you how much energy your *neighbors* are using as well. The statistics are anonymous, but might include a line at the bottom such as, "Other homes in your neighborhood used ten percent less energy (than you did) last month." Upon seeing such a statement, you are likely to wonder why there is a difference. Thereafter, the unspoken competition many of us have with our neighbors, called "Keeping up with the Joneses" (or the Zhangs, if you are living in China), will kick in and perhaps motivate us to make our homes or lifestyles more energy efficient. Does your power company not yet provide this information? Call them up and ask them, they might have it and be willing to tell you, or you might encourage them to start providing this information.

### *New Quantified Home Devices*

Once you have started tracking information, there are a lot of new devices that can make the process of home management easy, fun, and inexpensive.

## LOHAUS

For people that have central heating and cooling systems, a new type of thermostat will actually learn your behaviors and adjust the heating accordingly for the maximum savings. What's more, it will report its savings and stats to a website so that you can track, and control it, from anywhere.

These devices solve the inconvenience many of us have in changing the settings on the thermostat even once a day, much less the three or four times a day that is usually necessary for efficient use. Ideally, the thermostat should be changed when you wake up and when you go to sleep, when you leave the house and when you return. It's somewhat troublesome to do so. Waiting for the temperature to adjust can also be frustrating. As a result, many just leave the temperature at the most comfortable setting all the time, even when they are not at home. If you are in a Passive House, as described in the previous chapter, a single constant temperature all the time is by design. And, if you have pets, heating or cooling the house might be necessary, even when you are not at home. But for everyone else, adjustment is necessary in order to get the most comfort with the least cost in electricity or fuel.

Popular models, such as the Nest thermostat, whose manufacturer was purchased by Google for more than \$3 billion, both manage the tempera-

ture and track your usage patterns in your home. They are also described as *learning* devices because a number of built-in sensors can determine what time you get up, what times you usually go out of the house, what times you get home, and more. The learning effect improves over time as they track your behaviors and adjust the thermostat for the optimal temperatures by turning them lower or off when they are not needed. They also enable you to track your home usage in new and exciting ways. If you spend every Wednesday at a club meeting, your quantified home will learn this habit and control the temperature accordingly. They are not artificially intelligent, however, so if you have a cancellation of that meeting, you will still need to make an adjustment, but the connected nature of Nest and other home automation technology is now easily and remotely controllable. All you need to do is get out your smart phone and tell your system via its App that you are on the way home. It will make the house comfortable for your early return.

At LOHAUS, we use the Netatmo system of devices to collect data about our building. Short for Networked Atmosphere, Netatmo helps us track the temperature on each floor, as well as humidity, noise levels, CO2 concentration, outdoor temperature and outdoor air quality index. All of this information can be seen anytime, anywhere, with a

## LOHAUS

quick look at our LOHAUS Netatmo weather page on a browser or mobile phone App.

We use this information to decide when to turn on or turn off air conditioners, or whether or not to use energy-saving electric fans instead. If the temperature is hot but not humid, we use the electric fans, which significantly increase comfort but only use a fraction of the electricity. If there is high humidity, we may use an air conditioner as well, because it will help dry the air. We use the CO<sub>2</sub> monitor to decide when to open and close windows, exchange the air with air conditioning, or turn on additional fans for air circulation.

The system also helped us analyze the effectiveness of our various energy-savings initiatives, such as installing an insulated roof and windows. After those installations we noticed a big difference in the high and low temperatures. In the summer it used to get much hotter inside. In the winter it got much colder. The combination of the temperature measurement and monitoring gave us the data and the motivation we needed to make additional improvements in energy efficiency.

For lighting, we use a series of Radio Frequency Identification Device (RFID) switches to control lights in any part of the building with no more

than the power of a finger-press on the switch. Although not connected to an App or database, these devices still allow us to control the lights for maximum efficiency, based on where people are in the building. The central system does not sacrifice personal preference, a duplicate switch for each light is found in the room it is located, allowing the occupant to independently control the light. Overall the system is very convenient and energy-saving.

Another lighting solution we're considering is the Philips HUE lighting system. Based on Wi-Fi-enabled LED light bulbs, which can change color, this system also allows the user to customize both the timing and the quality of light in the building. Bright, white light when you need to work. Soft, yellow light when you want to relax. Colors and effects for when we have a party or event. Like the Nest, it is controllable via a smartphone App.

The solar panel system we installed on the roof of LOHAUS is also connected to the Internet via Wi-Fi, because we wanted to see online how it was performing under different weather conditions. While we could go and look at the readout on the inverter – the device that connects the panels to the grid and converts the electricity into a form that we can use in our building – this would have been inconvenient. When data collection is more

difficult than it needs to be, it tends to not be collected and acted upon. With the Trannergy networked inverter, we get statistical data over the entire life of the system, and a live update every five minutes of the energy generation. Because it reports live updates to a website, we can also easily monitor the health of the system from anywhere. If for some reason the system went offline during the daylight hours, we would almost immediately see the energy production go to zero and we could investigate the problem is. Without that kind of instant feedback, it might be days or even weeks before we noticed a system problem. This is yet another benefit of having a quantified home environment.

Using such Wi-Fi-enabled devices allows you to automatically track and calculate a number of other things.

For our solar energy system, we can see, for example, the equivalent number of trees that would need to be planted to duplicate the amount of CO<sub>2</sub> we prevent from being released into the atmosphere. We can also see how much money we are saving compared with buying the electricity ourselves from the power grid. It tracks data daily, monthly, yearly and for the life of the system. With the data being available to us, we also made

sure it is available to the public, so that anyone can see the beneficial effects of our system.

You can also see other systems in the area, and compare their statistics and information, which is a motivating factor for the operators to increase scale and efficiency. We at first installed a small system just as a demonstration of the potential of solar energy. After we saw how well it works, and compared our generation to that of other larger systems in the area, the data helped motivate us to create a bigger system with a bigger impact.

By creating your own Quantified Building, you will see many benefits, including savings of time and money. Not only that, you will have a record of your building's and its occupants' impact on creating a better urban environment for everyone. We hope that one day everyone will live in a LO-HAUS – a *Loft* of Health and Urban Sustainability.



## 3D PRINTING

**B**y now, many people will have heard of 3D printing but might not be sure of what it is – let alone why it is important to a more sustainable urban future.

In fact, the basic idea of 3D printing has been around for decades. Until only recently it was a high-end and expensive manufacturing process that was only used by large companies for prototyping or very complex manufacturing. The variety of 3D printing technologies and materials is greater than most people imagine. 3D covers everything from laser-cutting and computer-controlled shaping of wood and foam, to the creation of artificial bones and teeth, to the layer-by-layer additive manufacturing of plastics, ceramics and resins. And so much more. In China they are

now building, well... *buildings*, using the world's first printer that prints with concrete.

At the moment, the most common material to print in is hard plastic, in a variety of colors, but there are already printers for metals, woods, ceramics and more being created all the time. Bakers could use 3D printing technology to add value to their existing work, for example using a chocolate printer to create detailed, and delicious, creations that were not possible by hand. With the addition of a 3D scanner (also now available to consumers), the baker might create an image of the bride and groom and print a lifelike chocolate statue to decorate the wedding cake. New textures of printed chocolate could create new taste sensations. It will not be long before entire meals will be able to be printed by a specialized 3D printer that can output proteins, fats and carbohydrates, flavorings and colors.

3D printers, the materials they use, and related services are all presenting a variety of new business opportunities. As described earlier, the new economy means that people will face the challenge of old jobs disappearing but, as with every new technology, new opportunities will be created as well.

## LOHAUS

You could become, for example, some kind of 3D object designer. Today's equivalent might be a person who makes jewelry or accessories by hand, or sources them from other designers to sell at retail. The new job will be designing the jewelry in 3D design software, printing it on a metal printer (which you may or may not own yourself -- you could go to a print-on-demand shop instead), and then finishing it by hand. Or you might sell your design as a purely digital item, letting others buy and use it as they prefer. You could use your skills to customize an existing design for a customer. You might make a duplicate of a treasured family heirloom for them.

The software to do basic 3D design is free. The learning curve to using 3D modelling software is a bit steep but not insurmountable for most people with a few hours of practice on basic items. Most people start by designing a button or, in 3D printing terms, a flat cylinder with two cylindrical holes. Or you could simply download a design and print an existing button file very quickly. My first foray into 3D printing was a small replica of the Eiffel Tower. I quickly proceeded to making full mock-ups of the LOHAUS building.

It is interesting that I picked structures as some of my initial models to work with, because one of my first conceptions for a unique coffee shop back in

early 2013 was to be China's first 3D printed coffee bar, where all the utensils, cups, coffee pots and even furniture would be 3D printed on our own equipment. At the time, 3D printers that could handle ceramic printing were still in the development stage, and printers that could make furniture were quite expensive. We decided on a compromise. We'd open up LOHAUS and then explore the future of 3D printing through a series of talks, which we did in 2014, as well as attracting a member to the LOHAUS community who was passionate about 3D printing herself. She held classes to teach people how to make models using handheld pen-like devices that allow you to draw 3D objects by hand.

Perhaps the most exciting area of 3D printing for its potential to impact human health and longevity: 3D printers can already print artificial bones from titanium and teeth from ceramics. Living tissue is the next frontier. Working from the most basic building blocks, human cells, 3D printers are able to spray cells in a process somewhat akin to inkjet printing. Together with a binding agent to hold them together, the cells are then incubated and hopefully, one day, will become functional tissues and eventually organs, such as livers or kidneys. It is not as far off as some people think, with a machine for treating burn victims by spraying stem cells cultured from the patient's own

skin already being in development. This has been shown to reduce healing times dramatically and reduce scarring, compared with the typical process of skin grafts, transferring living skin from one part of the body to another, as is the case today.

Next up are tissues in our bodies' more complex organs, such as livers and kidneys. For China, this technology cannot come fast enough. China has roughly one million people on waiting lists for kidneys, with only 5,000 or so getting them each year. The black market takes care of an additional 10,000 or so kidneys, with some unfortunate people even selling a kidney to get the latest iPad or other Apple products. It is fitting then that China is a leading supporter of 3D medical printing research. Many innovations are expected to come from Chinese doctors and scientists in the next decade. They have one of the biggest problems to solve with organ trafficking, and therefore one of the biggest opportunities.

Without going into too much more detail about the technology involved and the materials themselves, at LOHAUS we think of 3D printers as *sustainable manufacturing*. They are important as part of the overall creation of smart cities because they democratize manufacturing, making it simple and affordable for anyone to create new objects.

Imagine the near future: Your family is about to have a home-cooked brunch on the weekend and an unexpected guest drops in. You invite them to join you, but you don't have enough spoons or plates or some other household item. With your 3D metals printer, you can do a quick Internet search for "spoon," and seconds later your printer will be outputting the desired item, all ready to be used. After dinner, it can be washed and used again.

With today's hobbyist-use 3D printers being relatively small, and filament – the material, in this case plastic, which is melted to create printed objects – wrapped in tightly wound spools that are compact, shipping printers and the filament over long distances, say to the farthest reaches of Tibet or Heilongjiang province will allow people to print their own items as needed. People no longer need to be without something simply because they are in a remote area. Anybody who has traveled far into the countryside and then tried to find a convenience store knows the problem. Finding what you need in a remote area can be difficult, if not impossible, at least if you need it right away. 3D printing locally will increase the quality of life for more people in China and around the world, as long as they have an Internet connection and a supply of electricity.

However, you won't need to be living in a remote area to get the benefits of 3D printing. There will be benefits for everyone, at virtually all levels of society.

The next section looks at the business models that are being created, and displaced by 3D printing.



When I was working in the early stages of the Internet and eCommerce development in the late 1990s, all of the marketing hype for business-to-business eCommerce and even business-to-consumer eCommerce was about one word: *disintermediation*. This word means taking out something, an intermediary step, in a process. Let's look at a simple case study to show the effect disintermediation had.

The traditional supply chain for a book to get written and eventually be sold to a consumer through the typical channels in the early 1990s looked like this:

Writer ▶ publisher ▶ printer ▶ warehouses ▶ distributors ▶ bookstores ▶ consumers.

Of course, it was and still is more complicated than that, what with libraries or non-bookstore

retailers, but when Jeff Bezos came along and founded Amazon.com, the effect on the supply chain was tremendous. Amazon first allowed the disintermediation of the retailers. In other words, the retail bookstores became less necessary as consumers could order books from Amazon online and have them delivered. As Amazon grew, it started to sell larger and larger quantities of books, such that even the biggest retailers such as Barnes & Noble and Borders to eventually close nearly all of their physical sales outlets.

As Amazon expanded its product lines in the early 2000s, Amazon invested in its own warehouses and, while doing so, made them more efficient and semi-automated. This further disintermediated traditional book warehouses and distributors.

And in just the last five years, the growth of print-on-demand and e-books means that Amazon (and others) no longer even need to deal with the traditional publishers, or even a printer if the author decided to sell only e-books. Using Amazon's marketplace, they could go directly to the consumer. Today, the supply chain above still exists but it is much more streamlined, and many of the smaller players have been merged or driven out of business by the new competitive landscape. For people using Amazon to produce or buy e-books,



the supply chain at its most efficient looks like this:

Writer ▶ Amazon marketplace ▶ Consumer.

But in creating this marketplace Amazon also allowed a glimpse of the future for writers, to produce work and sell directly to consumers, even bypassing Amazon itself. These writer-to-consumer transactions can exist as long as there is a method of payment and a delivery channel that is acceptable to both parties. These are the enablers, not actual physical parts of the supply chain, and these enablers are not directly tied to a device or product. They allow anyone to buy or sell any digital product anywhere at any time.

Books and music and movies are uniquely suited to this disruption of the traditional supply chain because they can exist as purely digital items. Books of text and pictures and diagrams can be represented as a PDF file, CDs of music can be sold as an MP3, and DVD movies can be viewed online as an MP4. This idea is more profound than it might seem at first because it is soon to become the norm in our society for a raft of products and services, not just media.

This next great disintermediation is bigger, and it is occurring right now: Physical products that once had no digital equivalent, including house-

hold objects, clothes, and even food, can now be represented as a 3D-printable file that can be sent online to anyone, anywhere and then printed by anybody with a 3D printer.

### **3D PRINTING AND THE MANUFACTURING SUPPLY CHAIN**

Today, a hypothetical supply chain for a physical product might look much as the supply chain for books once did:

Designer ▶ Manufacturer ▶ Warehouse ▶ Distributor ▶ Retailer ▶ Consumer.

It is similar to a book, in that any physical product must be built, assembled, transported and stored. Inherent in this process are a great deal of energy and effort, not always apparent. A piece of clothing, for example, may be made from cotton from Bangladesh that is woven into fabric and dyed in India, cut, sewn and packaged in China, and then sold in Europe for just a few dollars. At multiple times in this process, it will have been transported over land and sea by containers. It might eventually even be sent back to somewhere close to its place of origin when it is recycled and made into stuffing for a cheap mattress. All of this farm-to-store effort results in a huge carbon footprint. Not only that, but a large amount of water goes into the production of textiles.

A complex device like a laptop computer or smartphone has an even more complex lifecycle. It may contain processor chips from Intel in the United States, hard drives from Toshiba in Japan, screens from Samsung in Korea, and other parts and assembly from Foxconn in China, before being installed with software developed by computer engineers working for Apple all over the world, before being packaged and transported by truck, air and ship to markets globally.

The fossil fuel footprint of even a small consumer item may be very large due to all the transportation going on, or the great number of materials that must go into it, not to mention all the time and effort needed to design and build the product in the first place, which for a complex electronic consumer product can usually be calculated in *millions* of man-hours spent on design, programming, prototyping, and more pedestrian activities like flying people around for team meetings.

3D printing has the potential to change all of that.

### **HOW 3D PRINTING IS GOING TO CHANGE THE WORLD**

What might that future look like? At first, hobbyists and other early-adopter consumers will buy in low quantities, and the uses for the printers will

be relatively specific, such as a freelance designer printing out models at their home office. The next step will occur as 3D printers become more functional and fast. Where today printing even a simple cup might take more than an hour. But even with an increase in speed allowing families to use them to print some basic household objects, they will not replace the local Walmart anytime soon. Nor will home 3D printers put big manufacturers out of business. In the same way as home-use inkjet and laser printers did not cause bigger offset or specialty printing to disappear, there will be home version 3D printers as well as much more expensive professional 3D printers that might be faster, might print much larger objects, might offer more materials or colors, and so on.

One possible future might be a retail clothing store becoming a place where you go to look at sample garments in the latest styles, try them on (or use a computer simulation to project an image of you wearing them) before your body size is scanned, allowing the retailer to instantly print a near-perfectly fitting garment in minutes or less. Within a decade, there will be 3D printers located everywhere, in every store, for printing of shoes, clothes, and other custom-made items. These printers will join other new-format printers, such as the Espresso Book Machine, a large printer which prints pages and then binds them in an

book with an attractive color-printed cover, already in use today, to create almost-instant delivery of typical consumer needs.

Even before we have 3D printers in almost every home, as I believe will soon happen, we can today see the first steps toward this reality. Already, much of our buying has switched to online sellers rather than bricks-and-mortar retail. Many younger consumers never set foot in a physical store, relying on online shopping that is becoming ever-more sophisticated with full video, customer reviews, and online customer service. The one exception might be visiting a retail shop to try on an item, or be inspired to buy while browsing a physical shopping mall, before seeking out a similar, same, or substitute item online. Fueling this trend, China will soon be the largest eCommerce market in the world, surpassing even that of the world's largest consumer, the United States. However, the era of eCommerce purchase, followed by physical delivery of real goods will itself be short-lived. As soon as an essentially free downloadable file becomes available and a 3D printer is conveniently located nearby, people will prefer near-instant delivery with a small or materials-only cost, rather than waiting for the delivery and paying a higher cost.

The implications for brand names in various product categories are not look good. Obviously, if the effect of counterfeits on brands is bad today, imagine what it will be like when almost any design can be downloaded and printed with the click of a button. The era of the brand is surely shaking in its Nike shoes and rifling through its LV bag, looking for a way to stay ahead of the era of mass digitization with cheap 3D scanners, and customization, all done very close to the consumer rather than in some far away factory. Whether it is shirts or shoes, these items are already being custom-ordered with the buyer picking their preferred color, style, and customizations, along with a 100% return guarantee. At the moment, these items are made in a factory, but it won't be long before that factory gets closer, via local print shops, or is even in your own living room with your own 3D printer.

Thanks to 3D printing object warehouses, which also already exist today, you can choose practically any object and print a replica in a variety of materials. Whether it is an iPhone case, a ring, a glass, or a replacement part for something that was broken but not easily replaceable, you can already find almost everything online, for free. If you would like something a little more premium, or customized, there are also endless numbers of specially designed items, which can be download-

ed for a fee. Or, with a bit of training on 3D design software, you will soon be able to create your own 3D objects by first downloading a template and then modifying it to your need.

At the moment these 3D printed objects are often merely decorative, or are non-functional models, without working electronics or complex materials combinations or multiple colors. But 3D printers are getting better every day, with newer models allowing more materials and more colors to be printed and combined.

With one common technique of 3D printing being adding layer by layer, it is even possible to build complex internal structures that were formerly extremely complex or even impossible to build without breaking the object into several different pieces and assembling them later. A complex object is about the same amount of effort to print as a simple object of the same size. The data file might be a little larger, but to the printer it is essentially the same amount of work. A 3D printer can even print out multiple objects at the same time, albeit slowing down the pace of all of them.

### **THE THREE RS FOR 3D PRINTING**

Rather than talk about more of the many supply chains that will be affected by the growing so-

phistication of 3D printers, I like to focus on the overall benefits to society of using 3D printing in general. These benefits can be summed up as a variation on the *reduce, reuse* and *recycle* paradigm of sustainability.

When it comes to 3D printing, *reduce* might mean reducing the time and labor needed to get a product ready for production. Reducing waste might mean the amount of materials that can be saved during the design and manufacturing process. Reducing cost might refer to the savings realized by changing the structure of the supply chain. Let's look at each of this in turn.

3D printing is enabled by software that can design the product virtually, on screen, and then print a single object to test the design. This process is sometimes called rapid prototyping. Prototyping itself used to be very costly because creating a prototype might require first designing something to exacting specifications on paper, or using expensive design software, and then having a professional modeler hand-build or carve the item out of wood or foam to represent that which would eventually be made from plastic or metal. Such modelers were expensive, highly skilled labors, and the need to disintermediate them created the first incentive for developing 3D printing technology decades ago. At that time, the tech-



## LOHAUS

nology was patented and thereafter remained the exclusive domain of those who could afford the relatively high cost of the modeling equipment.

Today, much of that has changed. The design software is now cheaper, or even free, in the form of open source software, which anybody can use under certain restrictions. The previously patented 3D printing hardware technology is also now in the public domain, meaning that anybody can copy the original technology patents. And the materials used are no longer limited to wood or foam, the prototypes can be made from almost any material from plastic to metal, almost as quickly and maybe even faster than when it used to be done by hand. Reducing the amount of time needed, and the number of craftspeople and suppliers needed in the prototyping process, saves much productivity and expense. It is now faster and cheaper to design something through multiple prototypes and get it ready for production.

3D printing also saves on materials. By using 3D printing technology to manufacture, you can save significant quantities of raw materials over other manufacturing methods.

First, as 3D printing often uses what is known as additive manufacturing, an item is built layer by layer into a complete product, sometimes an al-

ready assembled product. With traditional manufacturing, you might start with a block or a rod or a piece of some material and then cut away the pieces, called subtractive manufacturing, until the item you want has been unlocked. The subtracted materials were usually waste, perhaps recyclable, perhaps not. Another type of manufacturing, injection molding, might first require a model to be created, then a mold to be formed from the model, that will allow the creation of the item in the injection molding machine. Injection molding machines are very large and very expensive so, to make manufacturing practical, usually dozens or even hundreds of identical items would be created each time in a mold. Such a process might often be outsourced, adding additional complexity to the business process. Whether done in-house or outsourced, the molds are injected with plastic or other materials, and finally the pieces are removed and the excess again cut away and the items are finished.

Injection molding has the benefit of speed, when not including the time it takes to create the mold, of manufacture. Generally it is less wasteful than subtractive manufacturing if the mold is done skillfully, but the manufactured items might still require assembly.

## LOHAUS

While injection molding is fast and efficient in large quantities, 3D printing has the benefits of reducing the amount of waste compared with subtracting manufacturing, and reducing the amount of time and cost needed to create a single item when compared with injection molding. The savings don't end there. Where a normal product must be packaged, shipped, warehoused and sold, 3D printing is reducing steps in the supply chain as well.

I see 3D printing as a form of sustainable manufacturing especially because it disintermediates many of the low-valued-added and wasteful steps in many supply chains.

For example, with 3D printing all you have to do is transfer an electronic file over the Internet in order to be able to print an object you need. In doing so, you will have likely done away with a dozen or more steps that used to be part of a supply chain. No more transportation is needed, other than the transportation of the filament materials, no more warehouses are required to store the items, no more retail stores are needed to display the item and no visit to and from the shopping mall is needed to buy it.

One of the most exciting possibilities of the coming era of 3D printing and digitization is the idea

that we'll also be able to recycle our items and reuse them almost instantly. Today, 3D printing materials, such as the spools of plastic filament that are using to make the objects, are still relatively expensive on a per gram basis. Making a small object that would cost a few cents on a mass production injection molding machine might cost a dollar or so more doing it yourself. However, this picture starts to change as soon as those materials become reusable.

Imagine needing a new case for your communications device. You search for a model you like, download the digital plan, customize it as needed, and print. Three days later, it breaks, or you just don't like the color anymore. Dump it into your materials shredder or a local recycling depot, get a new filament or a credit in return and then print a new one.

Recycling certain materials, like plastic, and printing out a new filament is already possible with a device called a Recyclebot. An open source project already exists, and several attempts at commercialization have occurred, demonstrating that, provided one has enough plastic to recycle, the cost of producing your own filament from recovered materials is a fraction of the cost of a commercially produced filament from new material. The recycling technology still needs more time to

mature, but I predict that, within a decade, almost everyone will have both a 3D printer and a recycler in their own home, allowing almost zero cost recycling and manufacturing for the cost of your time and the electricity to run the machines.

### **SO WHERE'S MY 3D PRINTER?**

Why isn't this glorious future of colorful plastic knick-knacks already here now? At the moment, one of the biggest barriers to everyone getting their own 3D printer is the cost of the printers themselves, still somewhat expensive. The second factor is the cost of the materials which, as explained earlier, are going to be costly until recycling becomes easier. A third factor is simply that the hype of 3D printers, my own exuberance included, has somewhat exceeded the reality of what 3D printing can do today.

That said, the costs of buying a 3D printer is getting lower and lower, now that many of the most important patents are in the public domain. The cheapest models available in China that can produce a comparable layer thickness and resolution to the most popular global 3D printer brand, called MakerBot now owned by Stratasys, are only 3,000 to 5,000 RMB (about \$500-800) less than half the price of a comparable U.S.-built 3D printer from Stratasys.

Another barrier to 3D printers being adopted on a wider scale involves problems with their speed and production cost per unit.

In injection molding, because of the high costs of buying the equipment and building the molds, your capital cost per unit is initially quite high, until you produce thousands or millions of units. At this point, the marginal cost per unit goes down so much as to be insignificant beyond the cost of materials. This is what makes outsourcing a popular strategy. By essentially renting somebody else's expensive injection molding machine, you get items produced at near their lowest marginal cost. At the same time, you have decreased your overall financial risks because you are not buying the expensive injection molding equipment yourself. This is how mass production wins out, by producing extremely large quantities where 3D printing would be just too slow. It is a strong business model, which is why much of the goods sold in our world today are manufactured in this way.

A 3D printer's capital costs, on the other hand, are very low to begin with compared with the large-scale injection molding equipment, but marginal cost per unit is always identical to the first unit, so you are immediately producing at the lowest possible cost. There's no economy of scale,

in other words. It also means that no savings are gained over time through the learning curve. In this way, if you are planning to produce a large number of identical units, 3D printing is expensive. But if you are planning to create just a couple of units, or constantly produce single one-time products, such as a customized name on the item, 3D printing becomes far more economical.

As filament prices come down, 3D printing of low quantities of unique items will be ever cheaper, though the design and modelling costs should also be factored in.

The space to store your own 3D printer is small, about the size of a microwave oven today, though such a printer is generally limited to producing items that are smaller than itself, unless multiple print runs of separate parts are done, then being hand-assembled into the bigger object. Traditional manufacturing methods are superior to the 3D printers of today in producing very large items that current 3D printers can't. A bigger 3D printer with a bigger footprint can make bigger things, but it is ultimately limited to the size of its printing enclosure.

That is not necessarily a barrier, as early innovators have still built large frames capable of printing large objects. China is leading the way here

with the world's first demonstrated house printer, able to build a single stand-alone unit with door frames and window holes, as well as interior and exterior walls, in about 24 hours. With the addition of a floor, roof, doors, windows, wiring and plumbing, you will have a livable dwelling in a matter of days, rather than weeks or months using traditional building methods. Within a couple of years, printers that can output concrete and other materials at the same time will revolutionize the construction industry and reduce the cost of housing significantly.



Technology is, of course, something of a Pandora's Box. Along with 3D printed organs, buildings and consumer products, we also get 3D printed guns. We can't easily have the technology for one without the other. However, another thing that is clear is that our urbanizing world needs new solutions to how to live better in cities.

Part of this solution will come from understanding *how* we live, using concepts like the quantified building to collect data about our homes, offices, and the people within.

The other part of the solution comes from adopting new technologies that will allow life in the cities to be more efficient and convenient, with-



## LOHAUS

out being more destructive to the environment. 3D printing is one such solution. So are all of the other technologies and ideas that have been discussed in this book. From sustainable materials, better insulation, clean energy and locally grown foods, all of them have a part to play in a better urban life.



## Next Steps

**T**o have a lifestyle of health and urban sustainability, live and work in holistic buildings, and live a happy life as a result, should be the right of all people. Yet all of those things require some effort, when they should be effortless.

We have created an energy-intensive global society fueled by cheap oil and other fossil fuels. While fossil fuels will remain plentiful, and may even become cheaper in the years to come, there is a hidden cost. The penalties for continuing our fossil fuel-enhanced lifestyles are climate change and pollution. The result is going to be rising sea levels, poor health and, eventually, much higher energy prices once those commodities really start to run out. That might take decades in the case of oil, or even hundreds of years in the case of coal, but if we continue expanding our use of fossil

fuels, it is a certainty they will become scarcer and, eventually, be used up altogether. Many of us will likely not be alive to experience it. But the effects are happening already and can be felt by all of us today.

As I write this conclusion, I look out the window into the Shanghai air and see smog. I read my AQI App's air quality update and understand the air quality index is *very unhealthy*. People are moving away from the big cities, where prices are cheap and services are efficient, and settling in other places where the local air may seem cleaner due to lower population density and less manufacturing. But, due to the need to drive cars, and provide energy for their suburban lifestyles, their carbon footprint might be even bigger. We can't blame them for wanting to put the health of their children, or themselves, above that of others, but we can't all move out of the cities. Something else has to be done.

That something is starting to adopt a lifestyle of health and urban sustainability for those of us who are willing, or need, to stay.



If there is one thing that you can do after reading this book, it is to pick something to change in your home or office that will have a lasting, ef-

fortless return on making our cities a better place. For example, replace all your traditional and fluorescent light bulbs with the most energy-efficient LED light bulbs. You will, at first, pay some money upfront, but then you will get a payback financially within two years, save electricity, and thereby help yourself and society by reducing pollution that might have come from coal-generated energy.

What if your power utility offers non-polluting hydroelectric power? That's great, but still switch to LED. What you save can be sold to other regions by your utility, preventing their power from being generated by a more polluting energy. Buying LED lights also helps, at the manufacturing level, to increase production volumes, which will lower the price and allow even more people to buy LED lights. To rephrase a famous saying by one of China's forward-thinking leaders, *some must get LED light first.*

This kind of change is powerful, because it is a one-time installation with an ongoing benefit, up to ten years or more. Selling your car and switching to walking, cycling, or shared car service is another. You will cut down on your fuel usage in the first cases, and cut down on wasteful materials use in the latter one. Electric cars and their benefits have been detailed herein, but it will be

some time before that option is widely available in countries such as China. It is happening, though, so if you can get one, then get one.

Other kinds of change will depend on undertaking new behaviors and habits.

Eating healthy is a challenge, but picking the foods that will keep you in better optimal health, and buying those foods from local farms and suppliers, helps you and helps the community. Exercising can be fun for some, painful for others, but avoiding chronic illness will lead to a better quality of life for you, and lower societal healthcare costs.

The Lifestyle of Health and Urban Sustainability uses simple principles that anyone can apply to their life in order to live better and impact the lives of others in a positive way.

You don't have to do all of them, or even five. You can start with one.

### **THE LOHAUS ONE PLEDGE**

I have created a number of personal plans to help me to adjust my behaviors and habits. I call them *One Pledges*. They are named this way to remind me to do, or not do, something for one hour a day, one day a week, one week a month, and so

## LOHAUS

on. You can make your own pledge, for whatever is important to you. Here is an example that I used shortly after starting LOHAUS, when I realized that I was spending far too much time online, on social media, using electronic devices that increased my carbon footprint, and as a result decreasing the quality of my relationships and my life in general. I call it my *One Pledge for Disconnecting*.

In this pledge, disconnecting is a way to both make a positive benefit on your personal life, to be more present, more mindful, with fewer distractions. At the same time, it allows you to reduce your energy usage. You might similarly create a *One Pledge for Health* which is more focused on healthy living and eating. It depends on what your goals are. This is just an example which works for me, in the specific area of reducing the time I spend with media, the Internet and my mobile phone and other electronic devices.

### *One Hour a Day*

For one hour a day, I will turn off my phone, stop looking at email, and avoid all media in general, including TV, music and movies, even reading. The purpose of this one hour is to be totally focused on something else. What that something is would be different for everybody. For some, it might be

their children or other family members. For me, it is my time at the gym or wherever I am when I exercise. It might be an hour of swimming with only the noises of the pool, or a yoga class. For me, when I am lifting weights I can totally focus on what I am doing and all other thoughts vanish.

Or you might turn off your electronic media at dinner, in order to enjoy the meal for its deliciousness and nutrition, and enjoy the company you are with. Or, and this is something I do in addition to my personal *one hour a day* One Pledge for Disconnecting requirement, I turn off my phone and never look at email before bed, in order to prevent them from disturbing my sleep. I've missed a few late-night telemarketing calls from Inner Mongolia, but I have gained peace of mind. Nor do I look at my phone for at least 30 minutes after waking, because I want my first minutes of the day to be spent being mindful and relaxed, not immediately frenetic.

### *One Day a Week*

For one day a week, I turn off all my communication devices for the entire day. For many people this is the hardest of all, because most of us have become accustomed to checking email at least once a day if not more, even on weekends and holidays.



## LOHAUS

Picking a weekend day is probably going to be easiest for most people, and it is usually my choice as well. Some New Economy jobs have regular hours and days, but for those who are fully embedded in the New Economy of flexible work, one day is pretty much the same as the others. They are already working in an on-demand part-time or project deadline basis, which determines when they work. To them, weekends and workdays are arbitrary distinctions of a bygone era. In the New Economy there are just workdays and non-workdays. For people that work globally, holidays might not even matter. Working on Christmas Day used to be a near-impossibility for me, because to do so was so different than how I grew up in Canada. But, after living in Japan and China for a total of 15 years, where Christmas Day is just another day, I've changed my habits. Picking a day in reference to other people's needs might mean aligning yourself to their schedules, for example leaving your unplugged day until a Saturday or Sunday, but in today's society where there are still so many people doing work on weekends, this may not make much practical difference. So, pick a day that works best for you.

One friend, Philip McMaster, created something he calls Three-Finger Wednesday. Hold up the middle three fingers of your hand, and you will see they look like a "W," and that's why he's

picked Wednesday for this special activity. This gesture can also be thought of as Peace Plus One, which his World Sustainability Project uses to represent the idea of one world in peace. Each finger represents, respectively, Smile, Change, and Unplug. Change refers to a number of things: Changing your habits, changing your energy use, eventually changing the world. He practices this every Wednesday and encourages others to do the same.

Whether it is a Wednesday or another day of your choosing doesn't matter. Doing something valuable with this time you gain is what matters. Rather than simply watching TV or using the Internet (which is no longer possible with all media devices unplugged, anyway), you could use this time to exercise, to study, to relax, to meet with people who are important to you.

### *One Week a Year*

For one week a year, I spend my time studying a new skill, learning while relaxing and taking a break from work.

There are a number of ways to look at this extended period of time. One week a year could be a vacation, but ideally for me this week is neither work nor vacation. It is a time when I let new pos-

## LOHAUS

sibilities enter my life. I take a course, or I go somewhere new, or I focus on something that I would not normally do.

Let me use an example from the management consulting industry. Management consultancies offer brains-for-hire, on-demand, 24 hours a day around the world, seven days a week. It could be said the sun never sets on McKinsey & Company, the world's top consultancy. But when the consultants don't have a client project to do, they are said to be "On the Beach." This means they are in-between engagements, not being utilized by a client. Brains-on-the-shelf.

This time is not to be wasted, though. It should be spent in training and professional development, new business development, and perhaps administrative duties like filling out the all-important time-billing documentation. The point being that it is a little time away from the regular work of research, analysis and presentations, to something a bit less intensive. Such times are to be used learning new skills and building your knowledge base.

No less a successful businessperson than Bill Gates practices just such an activity. He started doing this when he was still actively involved in Microsoft, and his hectic schedule did not permit him the time to focus on longer documents and

non-urgent reading. So he began collecting those documents and then, twice each year, take a week off from regular work activities to read them. He would summarize his thoughts at the end of the week and share them with his Microsoft team. Some of Microsoft's major strategy changes came about as a result of the thinking that he did while on these breaks. While his so-called Think Weeks did not specify a completely unplugged lifestyle, they were nevertheless a departure from his normal routine of work, allowing him to focus and think creatively.

How you choose to spend your unplugged time is up to you, but going somewhere for an activity, learning something new, getting back in shape with a detox or health clinic, or reading might all be good ideas. Just avoid emails, social media, preferably phone calls too. I prefer being alone, but it's OK to bring along people you really care about. I even like going somewhere I don't speak the language. This ensures that you are not distracted by other people's discussions. I went to southern China once where the local language is Cantonese (I speak Mandarin) and I was able to focus on my own thoughts even when in a crowded coffee shop.



## LOHAUS

Some people will say that my One Pledge for Disconnecting is impossible to follow in modern society. They might say their work demands they be available. Customers need to contact them anytime, anywhere. Competition is fierce. Disconnecting is anti-social. What if you miss something important? All valid concerns to be sure, and I admit, it is anti-social, especially by the definition of today's social media. You will not "share" anything, nor will you "like" anything. Your status will be shown as "Offline" and, for all intents and purposes, emails sent to you will exist in an electronic purgatory. A couple of years ago, I might have said this is too extreme, but now that I have adopted many of these behaviors, I find myself happier than I was before. It's not perfect, nothing ever is, but better.

### **HOLISTIC BUILDING, HOLISTIC LIFE**

The name LOHAUS comes from one part LOHAS, Life of Health and Sustainability, and one part Bauhaus, the German architecture and design movement of the 1920s.

To paraphrase Walter Gropius, who wrote the original Bauhaus Manifesto and Program in 1919, a complete building is one for which all aspects have been considered individually as well as for their part in the overall entity. While he was pri-

marily focused on the integration of art, architecture, practical uses, and accessibility for people, at LOHAUS I extend his concept to include a healthy lifestyle and urban sustainability.

Many of our buildings—commercial and residential—are fixated on a singular purpose derived from capitalist ideals of efficiency and utility. For example, an office building maximizes use of space in terms of the number of workers. A residence is almost totally devoted to housing its occupants in relative comfort without thought to the work those occupants spend eight to ten hours or more a day on. A store or restaurant or train station is used almost exclusively for the sale of goods or services or transportation respectively.

This model of building construction and usage worked for centuries, and is still the norm for many who are reading this book today. Under this model, people live disconnected home and work identities. Taking this model to an extreme, our traditionally constructed buildings can be thought to serve as barriers between our separate identities, while protecting us, entertaining us, giving us privacy, allowing us to focus on our work, but also imprisoning us within their limited scope of usage. That is, our buildings' fixated singular purposes limit the lives within because they

## LOHAUS

were designed for a society with clear separation between work, life, and all the places in between.

For example, it used to be that when we left the office we became mostly unreachable to our work relationships. This effectively allowed friend and family relationships to come to the fore as we made the trek home, occasionally stopping at a third place such as a coffee shop or theatre or shopping mall. Then the convergence of communications-, media- and technology-enabled work and life started to accelerate. It started in the 1980s with the advent of the pager, then the mobile phone, then in the 1990s with email and devices such as BlackBerry two-way pagers. Today, many of us keep an ever more precarious barrier between our various identities. We keep friends on Facebook, co-workers and business contacts on LinkedIn, chat with friends on Weixin – China’s version of What’s App, do business on Skype or QQ – China’s Twitter-like service. Even this balance is failing in a hyper-connected society such as China’s, where a single channel, Weixin, has come to dominate almost all the others in just a short three years.

Even the once-formidable barrier of needing a power-outlet with electricity is disappearing. Thanks to batteries, power is ever-more portable. To preserve battery life, or to save electricity, we

used to turn on our mobile phones and computers when we woke or arrived at the office, and turn them off later when we left or prepared to sleep. Now, extended battery life and low-power devices mean we leave many of them turned on all day and night.

Similarly, it used to be that physical wires were the limiting factor to network connectivity. Once we unplugged the network cable, we were off the network. This barrier is also disappearing quickly. For a while, our wireless routers' network signal strength was the limiting factor, meaning being out of range of the office or home wireless hub, we were disconnected until we returned. This led to the measure of free wireless at coffee shops, then other venues, and finally metropolitan area networks where entire cities are blanketed by Wi-Fi. Now, with 3G mobile and country-wide networks, there is practically nowhere we can be out of range, wirelessly.

So, as battery power gets better and as connectivity becomes ever more ubiquitous, we are quickly becoming 24x7 connected to the world. There is no more disconnection.

As a result, work follows us wherever we go. There remains only a superficial physical barrier between our work and home lives, but the "last



## LOHAUS

mile” between the mental and societal barriers is increasingly breached by tablet computers, smart phones, always-on Internet connections and cloud data storage, home delivery of practically anything we want to buy, as well as flexible, part-time, freelance and other forms of employment. While not designed for it, most spaces are becoming multi-purpose. We study at home or the office by eLearning, we work while on the road in hotels and airports. There is no longer an exclusive, single-purpose space.

All of the above is how the world, collectively, has changed. Some consider it a step backward, not forward. Being connected all the time everywhere, we may fear the loss of freedom and happiness.

At an individual level, there are two ways to react to change. One, we can reject and refuse to change, clinging to a way of life that used to be the norm. Two, we can change ourselves or, better, adapt our lives to the new society norms while maintaining balance and quality of life. By being proactive, rather than reactive, all of the negative connotations of the above can be turned into positives. That is my belief. I crafted these beliefs into a simple manifesto that describes what LOHAUS means.

## **THE LOHAUS MANIFESTO**

Enter LOHAUS, a flexible-use space in the heart of one of the world's megacities. At LOHAUS, people can work, meet, socialize, create, exercise, eat, drink, and live their multi-faceted lives in one place. LOHAUS is both a Loft *and* a Lifestyle of Health and Urban Sustainability.

Walter Gropius, the founder of the Bauhaus school, once lamented that the arts had become disconnected from the buildings that housed them. By the 1920s, art and buildings were created separately, losing an intangible benefit which might be called holism. While arts could be added, the lack of holistic thinking from the beginning impeded the attainment of the building's maximum potential. Conversely, the building and arts that were integrated together were greater than either separately. In much the same way, today's sustainable technologies and habits, such as clean energy or recycling, have been relegated to their own isolated places – solar and wind farms for generating energy, recycling centers for returning used goods – putting them out of sight, and out of mind. LOHAUS brings them back home into an integrated whole, a holistic building.

Why shouldn't power be generated at home? Why shouldn't recycling be done at the individual lev-

## LOHAUS

el, embodying the true spirit of the three R's: reducing, reusing and recycling.

At LOHAUS we reduce the amount of energy we use through technologies such as LED lighting and better insulation.

We recover and reuse materials, giving them a new life.

We separate our trash into raw and recyclable. The raw waste we turn into fertilizer in a composting worm farm, and then use the fertilizer to grow plants for the interior oxygen and air filtration they provide, and grow food such as mint, aloe and tomatoes, which can bring additional nutrients to the occupants. For recycling, we sell our paper and other waste to recyclers who will take care to properly reuse the material or pass it on to larger recycling facilities.

To this we add a fourth R – renewal of body, health and mind through more intelligent consumption.

At LOHAUS, we use stairs daily, to climb up and down six stories. We don't install an elevator, saving both electricity and space. Exercise does not have to be in a gym or heated swimming pool.

We encourage healthy commuting. Walking to work or riding a bicycle. If necessary, taking a subway and bus, where a walk to and from the station is healthy as well as more sustainable and clean. When needed, electric vehicles and propane-powered taxis can be used, rather than gasoline-fueled vehicles.

At LOHAUS, we believe that all of these must be done individually before they can be accepted and be effective as a society. This is part of a holistic life.

Bauhaus in German means House of Construction. LOHAUS means Loft of Health and Urban Sustainability. We are constructing holistic buildings and holistic lifestyles of health and urban sustainability.

Join us.

## ABOUT THE AUTHOR

Jason Inch is a social entrepreneur, writer, and educator based in Shanghai since 2004.

He is the founder of LOHAUS, the Loft of Health and Urban Sustainability, a Shanghai-based social enterprise that promotes clean energy and new ideas for urban innovation. In 2014, LOHAUS built the first downtown grid-connected solar rooftop in Shanghai. It is also one of the oldest buildings in China to have been retrofitted for sustainability. At LOHAUS, Jason hosts events which promote awareness and action on environment and urbanization challenges. His core mission as a social entrepreneur is to help alleviate Shanghai's air pollution and provide a better quality of life in China's cities.

Prior to establishing LOHAUS, Jason focused on writing and education. He has written two books, including 2012's *China's Economic Supertrends*, which also has a Mandarin edition published by China's Central Compilation & Translation Press.



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