*The Craig Patterson Writing Prize*

# *The Challenge of Sustainable City Living & the Scale of Community*


sophia

Entries for the Craig Patterson Graduate Writing Prize competition: The Challenge of Sustainable City Living & the Scale of Community

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For further details see:
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www.ucl.ac.uk/sustainable-cities

# Contents

# Editorial

At *Sophia* we are thrilled to be publishing an anthology of the entries for our writing competition: 'The Challenge of Sustainable City Living and the Scale of Community'. We were contacted by UCL Grand Challenges earlier in the year and it has been a testing but ultimately fruitful challenge for us to organise the competition and to determine those entries which we thought deserved special recognition.

In order that the competition might appeal to as broad a range of entrants as possible, we deliberately encouraged a loose interpretation of the theme and the entries we received have indeed spanned a wide range of writing styles; from bullet points to stanzas of verse.

We're very grateful for the opportunity to cooperate with Grand Challenges and hope that this anthology will help to bridge between their Sustainable Cities initiative and UCL's research community at large. We would also like to thank all of the entrants for their creativity and patience during the judging process. We look forward to working with Grand Challenges again in the coming year.

*Ed Long, Sophia editor*

UCL's Grand Challenges programme is delighted to have been able to link with the excellent Sophia magazine through the Craig Patterson Writing Prize competition, in memory of my predecessor - a great enthusiast for the potential of UCL to make a real impact in the world. Nicholas Tyndale (Director of Communications, Grand Challenges) and I were greatly impressed by the quality, innovation and variety of the competition entries and offer our congratulations to the overall winner, Olivia Hamlyn of UCL Laws, for her creative and visionary word picture of an imaginary city, Athanasia, in harmony with Nature, in 'Sustainable Cities;' and to runner-up Ilan Adler, of UCL Civil, Environmental and Geomatic Engineering for his compelling description of the challenges faced by Mexico City as it comes to terms with 500 years of dependency on, and depletion of, the aquifer on which it sits, in 'A Call for a New Paradigm.' UCL's Grand Challenge of Sustainable Cities (GCSC) is supporting and developing an exciting programme of activities for the current academic year, in consultation with a broad constituency of academics and researchers across the College. To date we have screened and held panel discussions on two films of relevance to the UN Climate Change Conference in Copenhagen - 'The Age of Stupid' by UCL alumnus Franny Armstrong, and 'Invisible' by Roz Mortimer. During the Spring and Summer terms there will be opportunities to attend and contribute to other GCSC initiatives, including 'Cities & Water,' 'Cities & Migration,' ' Planet U(CL) - Embedding sustainability in the university,' ' Healthy Cities,' and 'London 2061.'

*Ian Scott, UCL Grand Challenges*


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Sophia Judging Panel

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Ian Scott
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Thanks to Tola Okogwu for help with organising the competition

# A Call for a New Paradigm

Second prize

*Ilan Adler, PhD Water Quality, Department of Civil & Environmental Engineering*

ALLOW ME TO TAKE YOU on a virtual tour through Mexico, one of the largest Mega-cities in the world. Walk across its grand arches and plazas, through the traffic, the busy streets, the mildly polluted skyline that on happy occasions will allow a glimpse of mighty volcanoes on the fringes. And as you enter the *Zocalo*, as they call the main square, surrounded by overpowering structures and old temples, vestiges of an Aztec and Spanish past, notice the massive concrete floor furnishing the centre of the plaza, and, alas, it is lower than the ground-level of the buildings all around. And the Grand Cathedral, is it slightly bent to one side? Is this city, indeed … sinking?

The answer is yes. It's been sinking for the last century at least, and in some parts reaching an alarming record of 9 meters! What happened? Let's go back a little.

Over 500 years ago, the Aztecs built a beautiful city here, right on top of a highland lake, which both enchanted and terrified the first Spanish soldiers to arrive. They never expected such a glistening jewel in the middle of this valley. Yet they were scared of water, especially at the military prospect of being 'trapped' among the many bridges which connected the city to mainland. So it happened that in the period of a hundred years after the ultimate and final defeat of the Aztecs, they started to drain the city, literally, by cutting through huge tunnels and channels that would cross the mountain valleys, slowly flushing out the lakes. At the same time, they set about urbanizing, paving and planning the new city following a European model (the only one they knew), with square plazas, cathedrals, cobbled stone paths, and the like.

The City, stubbornly insisting on living as if it were on common dry land back in Spain, suffered repeated floodings, as heavy rains in the valley would overcome whatever drainage the Spaniards had constructed, forcing them to make even greater and larger tunnels, authentic feats of engineering, in order to get rid of excess water. The problem was more or less settled by the 17th century, and finally Mexico, as it was now called, expanded freely as one of the important colonial capitals and seats of power. The old lake sadly shrunk to near oblivion. Little did these urban designers know that trouble was in the making: at least for the future generations.

But, as the Monkees once said: 'that was then, this is now…' By the beginning of the 20th century, with the advent of modern sanitation and sewage, the city needed an elaborate drainage system to get rid of the wastes generated by an ever growing population. Taking advantage of their highland situation (the city is located at roughly 2500m above sea level) it was decided that sewage would flow out of the valley by gravity, down to one of the many neighbouring rivers that eventually winds up in the Gulf of Mexico, on the Atlantic Ocean side. But Alas again, the city was already starting to sink due to the increasing over-extraction of water from its innards, and there came a point when the stinking, gravity-fed canals just 'wouldn't flow'. Urban planners and civil engineers of the time scratched their heads (as they normally do) and decided: 'hmm, let's *pump* it out'. Thus, expensive and energy-intensive pumping stations were installed to move human, and not-so-human, wastes along. This is the case to this day where, from the a place called the *Gran Canal* station, over 30 000 litres per second of sludge and rain are happily pumped up and over the hill, so that they can continue flowing down to the rivers, like in the good old days.

However, problems like this don't usually come alone. Around the mid 20th century, the city just could not keep on supplying over 2 million inhabitants, and growing, with enough drinking water from its dwindling aquifers. At the same time, the bit about sinking started becoming a real problem. Important buildings and historical monuments were looking warped, bent or in danger of collapse, including the Grand Cathedral and the golden *Angel de la Independencia*, among others. Thus another journey began: the quest for external sources of water. Like a giant squid, the city extended its arms to the countryside and started sucking out large amounts of water, timidly at first, one may say, and then boldly and greedily, witnessing what today is called by

the vexing name of *Proyecto Lerma-Cutzamala*. This gigantic network extends well over 200 km and actually lifts water 1000 meters from the lowlands into the capital city, consuming in the process the same amount of electricity as a medium sized city. When this project was completed in the late 80s, it was believed that finally the city would achieve some balance regarding water, but by then the population was already surpassing 10 million! Like most Latin-American capitals, people were flocking in from the countryside in hordes, trying to scratch a living in the city, repelled by miser conditions in the rural areas, and attracted by promising oil booms and so-called development.

It didn't work out. At the turn of the millennium the city simply did not have enough drinking water to meet its needs. Today, official figures estimate that at least one million inhabitants don't have access to the vital liquid, and around 7 or 8 million don't have what is known as 'adequate service', meaning frequent and long interruptions in the supply, or poor quality water, when it does arrive. The situation reached its peak this very year, 2009, when the City Government (paradoxically in the midst of a heavy rainy season) declared everything short of a crisis, as many neighbourhoods got their water service suspended for days on end. In Mexico City, today, it has become a common sight to see water trucks lining up in front of restaurants and cafes, filling in their cisterns; a noisy affair, yet better than closing down the business.

## So what's next?

In summary, we have a pretty little mess. A city that used to be surrounded by water, today actually struggles to get rid of it after it becomes 'waste', and where rains are so heavy that cars get bogged-down and neighbourhoods get flooded. Yet at the other end of the spectrum, water is so scarce that it needs to be brought from very far (and very low), at a massive social, financial and environmental cost, and is still not enough to meet the basic needs. The same paradigm is probably faced by most growing cities around the world.

The solution should seem simple then. Just put these two together: You have rain and wastewater on one side, a lack of drinking water on the other side, and enough technology to bridge the gap between the two. Make rain potable, treat and purify wastewater enough to make it usable, in some form or another, we know the story, so what's stopping them? I mean, wouldn't it be even cheaper? You probably got the answer, it's a change of paradigm that's needed, the technology is basically there, and in the long run the investment pays off by itself, quite rapidly in fact. So if it's not money, not a technical issue either, what is this new outlook required?

To explore the question, we need to plunge back into the historical archives. Ever since the 18th century, the vision that came with the industrial revolution and the advent of Capitalism was that of supply and demand. In other words, if that obscure agglomeration called the market badly demands something, and it is technically feasible, be it a service or a product, then someone out there will deliver it or find it for them, given the right price is paid. Applied to resource management, it means: 'you want water, I'll get you water' (did that just sound like a Texan cowboy? If so, my apologies, coincidences do happen). In more elegant terms, it is called 'supply-side management', and as a doctrine it has ruled the world for the past 150 years, at least. So Hydraulic engineers will scan the countryside, analyze the wells, inspect lakes and streams and bring water to wherever is needed, they will do whatever it takes to get it there, even if they have to pump it for miles on end. The same applies to electricity, energy, metals, minerals, and pretty much every resource you can think of for modern society and cities to function. The crux of the matter is planners of this sort will rarely ask the question: 'do we really need this'?

In fact, the question is considered almost taboo, forbidden ground. When, together with a team of colleagues, I presented some ideas on decentralized water planning to the Directive of the public water utility for Mexico City, I was quietly escorted out the door with polite promises such as 'your ideas are very interesting indeed, we like these things, and we'll get back to you'. With a smile the door was closed on our faces, not to open again, at least not yet, or maybe till 'the sh*t really hits the fan', as North Americans are fond of saying.

Proposals that dare consider the reasons behind consumption are not usually considered 'serious' by conventional urban planners. The Market has become some sort of deity, unquestioned in its deeds, and if it needs a certain amount of anything (whether it be water, energy or something else), so be it, we must scurry around and provide it. That's the very essence of the Supply-Side approach. But it's not an intelligent approach in this day and age. At the very least we have to admit that it's simply not working. The other alternative is 'Demand-Side' resource management, and that is where it all comes together, but of course, as you shall see, it requires a certain amount of soul-searching, changing habits included, and most people don't usually like that.

## Taking the Plunge

Let's illustrate this Demand-Side Approach with a little example. Could we tackle the water issue in Mexico from another perspective, 'thinking out of the box', so to speak? OK, so let us begin. How many toilets and urinals does Mexico City have, and how many times a day are they flushed, ever thought about that? With over 25 million inhabitants (including the surrounding metropolitan area), I would dare say, without any accurate figures, that we should have at least 1 million toilets and around 150,000 urinals (for the men's rooms). Assuming these are standard bathroom pieces, that would be 6 litres per flush for the WCs and 4 litres for the urinals. This would be a best case scenario, because in fact a few toilets here are still of the 'old' type, which consume roughly 18 litres, despite a strong Government program a few years back to replace them. But let's be conservative and go ahead with the math. We should consider that some bathrooms are not in use while others receive more than intensive occupancy (such as in busy shopping malls or gas stations), so if we consider an average of 5 'flushes' per day per unit, you would have a baffling 33 million litres of water per day. If we added the average leak rate for Mexico City, which is about 40%, we can then safely estimate that, at the very least, 40 million litres of water *each day* in this city are literally being flushed down the drain!

What then would be an easy solution? Any clever 8-year old would quickly raise up his hand and say 'just change the toilets'. Especially if he knows and has seen more efficient alternatives, such as the dual-flush system, highly popular in Europe, or the waterless urinals, already manufactured and successfully installed by several companies in Mexico. If we wanted to be a bit more radical, then modern, odour-free, dry composting toilets could be installed wherever applicable as well. The implementation of such a program could easily cut the consumption in sanitary systems by half. So *voilà*, 20 million litres of water have just been 'produced', without having to pipe it from anywhere. Add now efficient showerheads and faucets, rainwater harvesting, stricter norms and powerful incentives for treating and reusing wastewater, and all of a sudden, the 'water problem' is gently solved, without a single work of massive hydraulic engineering.

It makes you wonder then, why only a few years ago Government officials were proposing multi-million dollar investments to bring water into the city from surrounding rivers and reservoirs, even farther away than the existing works. And naturally, since the world has grown ever more dense and complex, peasants of these regions refused to allow the engineering works to proceed, because they were afraid (and rightly so) that it would affect their own badly needed water supply! Blockades and protests carried on for a while, until city planners had to retreat. But they didn't give up, not so soon, for we engineers are after all a stubborn kind. They started looking for more rivers in other directions, exhausting all possibilities, only to discard the projects again after looking at the figures. Even if the initial investments could be advanced (gigantic pumping stations, extensive pipelines sometimes running through rugged terrain), what about maintenance costs? With oil already in dwindling supply (it is estimated that in less than 30 years, Mexico won't have any more petrol to export), we can only imagine the costs of electricity for pumping and purifying massive volumes of water every day. That would assume, of course, that population and demand are remaining stable, which they are not. An expected increase in the number of inhabitants will only make any gigantic hydraulic project seem obsolete in a few years, so even if the large amounts of cash were in fact released, the problem at large would remain unresolved.

## A new City

In summary then, we understand that it would be way more cost-effective to tackle demand rather than just find new sources, which at the moment is not feasible anyway. The answer is to change patterns of consumption, investing in efficient and newer technologies, along with a massive education campaign to cut down on consumption. True, the Mexican Government has already done some of this, but it is only seen as a 'complement', not as a main policy goal. If indeed all the effort, both public and private, were channelled in this direction, the changes would be quite impressive. The same can be said not only for water, but also for energy and other resources. We could envision the cities' roofs producing solar power and feeding it back into the grid, for example, along with biomass from the waste streams being recovered and converted to energy and nutrients.

For one, the paradigm of the 'Octopus City', which greedily spreads its tentacles all over the countryside in search of resources, can be reversed. The potential for investing in cutting back demand and increasing efficiency is virtually unlimited, as new ideas for smarter consumption constantly arise. The surplus money saved

from costly maintenance (and from avoiding large, centralized, hydraulic works) can also be channelled into even more research for developing improved technologies, creating jobs in the process. Why, we can even imagine a bright future where Mexico City, in the midst of a heavy rainy season, first catches all the rainfall it can in individual and collective cisterns, and then actually gives back the surplus to the countryside, allowing the water to flow downstream using the existing pipelines, now in the opposite direction, to where other towns can use it, creating in the process beautiful landscapes and better conditions of life for everyone.

*'Let us not go gently*
*into the endless winter night…'*

Rush (Canadian Rock Band)

# *Biolime: The Mock Rock*

*Rachel Armstrong, Research Fellow, Bartlett School of Architecture*

This is a Science Faction story. In other words, it is a narrative based in scientific research that is currently taking place but which has not yet been made publicly available. The technology is based on experiments that are being conducted at the Bartlett School of Architecture in collaboration with the Center for Fundamental Living Technology at the Southern University of Denmark in Odense.

The essay serves to speculate on the effects of an emerging 'Living Technology', one that possesses some of the properties of living systems but is not actually alive (ISSP, online), when it is introduced as a way of making the buildings of *Mossville* more sustainable, a suburb of the imaginary city of *Hardwich*, by coating their houses with Biolime, a synthetic rock that is capable of producing limestone by fixing carbon dioxide from the air. Although Biolime goes against the conscientious community's notion of what is 'natural' they come to accept that all other methods of generating a more sustainable environment have not sufficient to reverse the carbon trend and new 'unnatural' measures are justified.

For those that had never been to the city of Hardwich, it was impossible to tell whether the houses in the Mossville region, had actually come 'alive' or not, for whenever sunlight stroked the mineral-clad buildings their facades seemed to quiver with an energized, metabolic glow. Early morning joggers took advantage of the freshening air caused by the solar activation of the limestone, whilst dirt stains faded and curious cellular plant life toyed at the edges of the slowly creeping rock as if they were deciding whether they had encountered a friend or foe.

The Biolime surface coating on the outside of the *Mossville* houses had been deemed a 'friend' but the new technology had not been accepted without controversy. Indeed, if it wasn't for the irrefutable fact that climate change was happening even faster than all forecasts had