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SCIENCE SPEAKS

HEALTH • ENVIRONMENT • NEW TECHNOLOGIES • SOCIO ECONOMICS

SPECIAL ISSUE
AXA RESEARCH FUND

SELECTION

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SCIENCE SPEAKS



**THROUGH THEIR WORK, RESEARCHERS AND
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BUT NOW, OUR NEED FOR SCIENCE HAS TAKEN ON NEW
URGENCY.**

In the era of opinions, beliefs and post-truth politics, we badly need science and the principles at its core: critical thinking and the scientific approach.

This is why *The Conversation* was launched in Melbourne in 2011. The idea was to create a current affairs website, backed by real research. Today, *The Conversation* has a global presence, with articles by 36,000 researcher-academics. We are more determined than ever to shed light on public debate with substantiated analysis from leading specialists.

Partnering with the AXA Research Fund was a natural step: our two international networks were made to work together. Today, the AXA Research Fund supports more than 500 projects worldwide and contributes significantly to our site on questions of health, the environment, the economy, and emerging technologies. *The Conversation* has already published 46 articles from 22 academics backed by the AXA Research Fund, in French and in English.

That's more than 1 million reads!

It is invigorating to see the vast array of work that is presented here.

DIDIER POURQUERY,

Chief editor of The Conversation France. 

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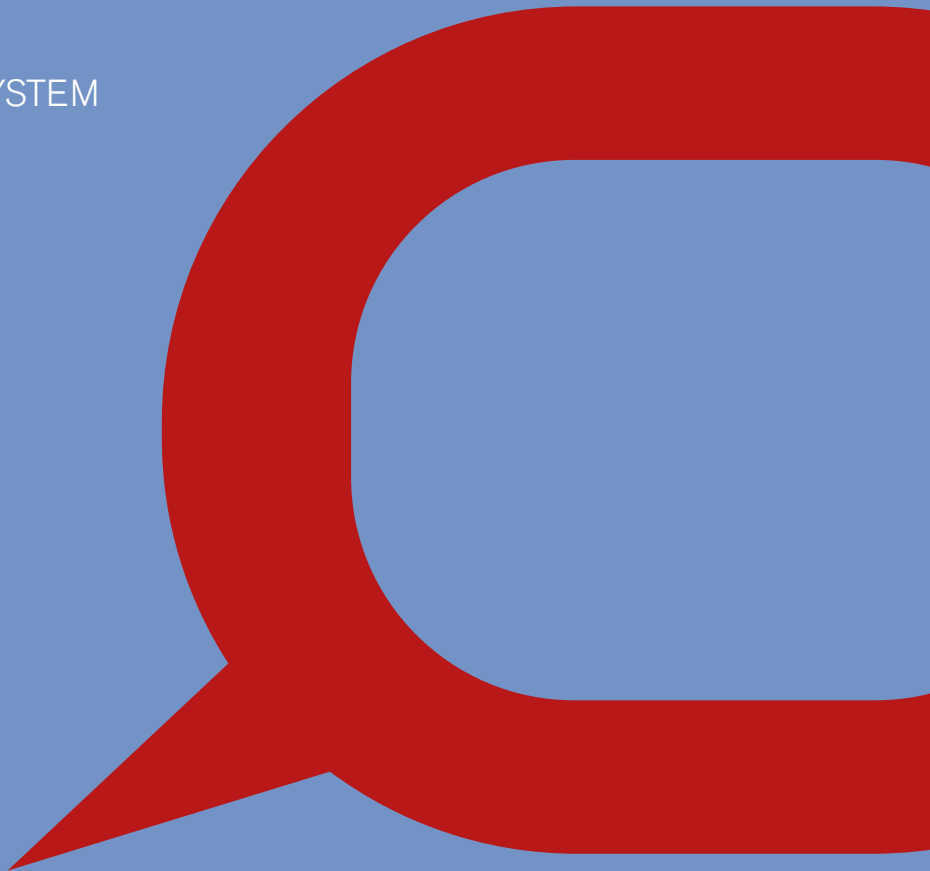
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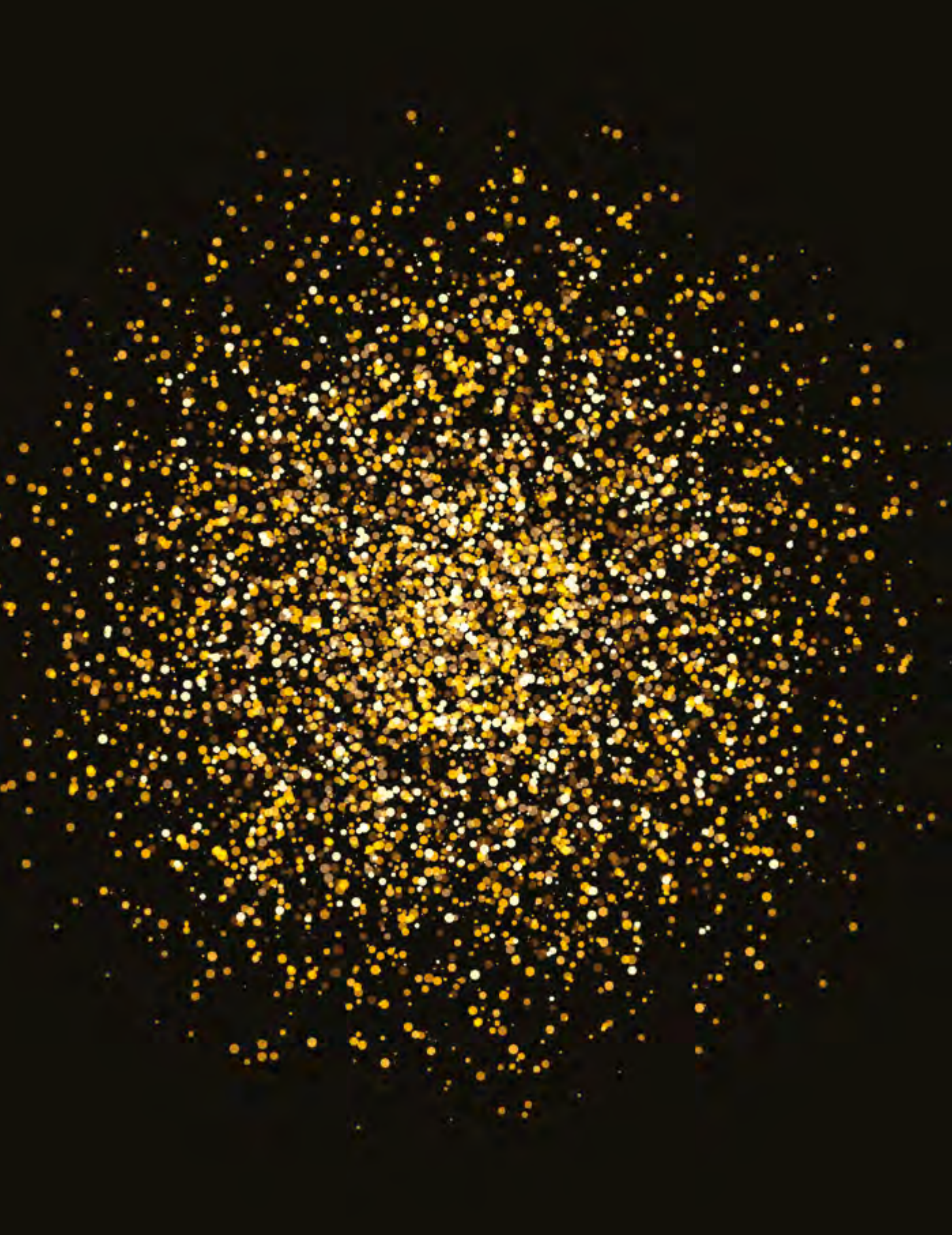
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DESTROYING TUMORS WITH GOLD NANOPARTICLES



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ESPCI  PARIS

GOLD CAN BE USED TO MAKE JEWELRY, BUT ALSO TO FIGHT CANCER. SEVERAL CLINICAL TRIALS ARE CURRENTLY UNDERWAY IN THE UNITED STATES WHERE PATIENTS ARE BEING TREATED WITH GOLD NANOPARTICLES.

In its natural state, gold is a yellow, chemically inert, non-corrodible metal, making it a noble material that does not degrade over time. These properties, along with the ease with which it can be shaped, have made it the favourite metal of jewellers.

On a nano-metric scale – that is, at a millionth of a meter – gold has other remarkable properties. On this scale, gold particles take on various colours according to their shape and size. This property has been used since ancient times to colour glass and earthenware – giving them, for example, an intense ruby hue. When light is shone on gold nanoparticles, the metal’s conduction electrons are excited by the light wave and begin to oscillate. This oscillation is particularly intense for a given colour in the light spectrum. This is called resonance.

By changing the shape or size of the nanoparticles, it is possible to choose the resonance frequency that has the strongest interaction with light. The nanoparticles then behave like tiny, highly effective antennae, and although they are extremely small and highly diluted they can give vibrant colours to stained glass.

“The idea is to destroy the tumours with photothermia.

One incidental consequence of this intense interaction with light is that nanoparticles heat up. This remarkable property is the reason behind their use in new cancer therapies. The idea is to destroy the tumours with photothermia – in other words, to locally heat up tumours “decorated” with gold nanoparticles by exposing them to light.

Patients being treated this way are first injected with gold nanoparticles into their bloodstream through an IV. Since gold is biocompatible, it presents no apparent danger to health in the concentrations used in therapy, as borne out by our studies in mice. However, not all questions have been resolved concerning these new applications. Gold nanoparticles go undetected by the body’s immune defence system. Their nanometric scale means they are generally one hundred times smaller than cells, allowing them to move freely through the blood system and enter the tumour.

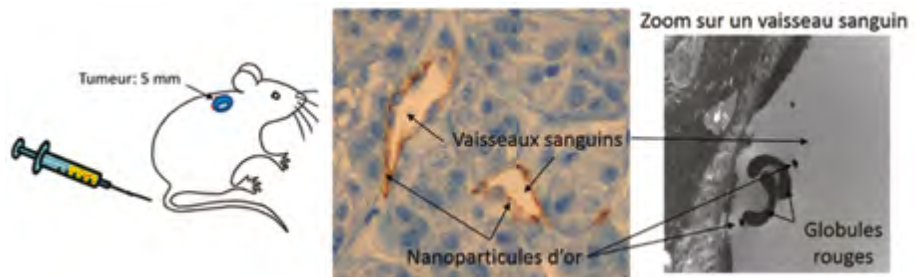
They must then be concentrated inside the tumours, many of which are highly vascularized – they naturally acquire a network of blood vessels allowing them to grow. Using this pathway, the nanoparticles easily accumulate inside the tumour. The altered structure of the blood vessels in the tumour area makes them more permeable, facilitating a high retention of nanoparticles.

Tumours “decorated” with gold nanoparticles are then exposed to light, in order for them to heat up and be destroyed. At this stage, the challenge is twofold. While the light must penetrate the body and reach the tumour, healthy tissue must not be heated. The choice of frequency is therefore vital. Nanoparticles must be lit up at their resonance frequency, but it is just as essential that the tissues without nanoparticles not absorb the light.

While our bodies absorb light in the visible part of the light spectrum (that is, all the colours of the rainbow), this is not the case in the near infrared. We can see this by simply placing a hand over an intense white light. Only the colour red, on the edge of infrared, can move through the flesh of the hand.

This range of the spectrum in the near infrared is often called the “therapeutic window” – the range that can be used in medical treatment. In the visible spectrum, light is mainly absorbed by hemoglobin, while light further into infrared range is absorbed by the water contained in our bodies.

Gold nanoparticles are injected into a mouse carrying a tumour. Five hours later, sections of the tumour are examined through an optical microscope (centre). We can see the gold nanoparticles.



NANOPARTICLES WITH SPECIFIC SHAPES

By playing with the shape of nanoparticles, it is possible to adjust their resonance so as to target the near infrared therapeutic window. This is carried out, for example, for nanoparticles with a silica core and a gold shell, for gold nanorods, or for nano-cages shaped like porous cubes. Preclinical studies (in animals) have enabled us to test the safety and effectiveness of various shapes of nanoparticles.

In the therapeutic spectrum, light goes through our bodies, but our bodies are not totally transparent to it. The light that comes out the other side is still highly diffused by the body's tissues. For instance, one cannot see bones in this way, as you would with an x-ray. It is also very difficult to focus a beam of light on a tumour from outside the body, since the light must travel through healthy tissue to reach it.

It is therefore usual (in animal studies) to light up tumours more closely, by inserting a needle through the skin, attached to an optical fibre linked to an infrared laser. The light is then far more intense in the relevant area.

STUDIES UNDERWAY ON HEAD AND NECK CANCERS

Under the light, the gold nanoparticles heat up and “cook” the tumour, thus destroying nearby cancerous cells. Extensive studies have been carried out in animal models on cancers in the brain, prostate and pancreas, for example. Clinical trials are also underway in the United States in patients affected by treatment-resistant head- and neck cancers, and lung- and prostate cancers using AuroLase therapy (Nanospectra Bioscience).

Alternatively, nanoparticles can be used not as a direct weapon against the tumour but as a means of transport (called a vector) to deliver molecules – drugs, for instance – to their destination. This technique requires less heating. The use of vectors should reduce the toxicity of treatments by better targeting cancerous cells.

“The gold nanoparticles heat up and “cook” the tumour.

THE TROJAN HORSE STRATEGY

It is possible to increase the number of gold nanoparticles entering a tumour, above and beyond the effect of simple passive accumulation. They perform better when covered with molecules (antibodies) that specifically attach to cancerous cells, which they recognize through the proteins present on the cell membrane. Other alternative techniques adopt a “Trojan horse” strategy. These use a kind of white blood cell, called macrophages, filled with gold nanoparticles in order to penetrate more deeply into the tumour.

Gold nanoparticle photothermia is a promising new therapy in cancer treatment. It has begun to be used experimentally in patients with certain specific cancers, but much research is still necessary before it can be adopted more widely. In the future, the technique will have to target the tumour more effectively and exclusively. With thriving research, this therapy should be available, alongside existing treatments like radiotherapy and chemotherapy, in a few years’ time.

Translated from the French by Alice Heathwood for Fast for Word

May 3, 2017 

“Gold nanoparticle photothermia is a promising new therapy.”

Disclosure statement:

Emmanuel Fort received funding from the AXA Research Fund.



EUROPE IS GOING GREY: CAN EU COUNTRIES WORK TOGETHER TO CARE FOR THEIR ELDERLY?



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EUROPEAN SOCIETIES ARE AGEING. IN 1950, ONLY 12% OF THE EUROPEAN POPULATION WAS OVER AGE 65. TODAY THE SHARE HAS ALREADY DOUBLED, AND PROJECTIONS SHOW THAT IN 2050 OVER 36% OF EUROPE'S POPULATION WILL BE 65-PLUS YEARS OLD.

The culprits are fertility rates and longevity. In the past, a woman in Europe had on average more than two children. Since 2000, the fertility rate has fallen below that threshold. Europeans are also living longer now: 78 years on average, up from 66 years in the 1950s.

Prolonged human life is a sign of Europe's prosperity, but combined with the region's low fertility rate it is also creating an array of social and financial problems for the continent.

Perhaps most critical is the fact that the share of working people who can provide care to the older persons is shrinking, even as the number of people needing care grows.

This imbalance between demand and supply, which leads to shortages in nurses and other professional care providers, is already challenging the fast-ageing countries of Germany, Finland and the United Kingdom.

The increased demand for care will also require significant financial resources. In 2014, OECD countries were spending on average 1.4% of GDP on long-term care, but these costs are projected to rise substantially through, reaching 6.4% by 2060.

Public spending on long-term care is highest in the Netherlands and Scandinavian countries (where it costs 3% to 4% of GDP) and lowest in Central and Eastern Europe. In Poland, Hungary and Estonia, less than 1% of GDP is spent on long-term care.

This difference in expenditures reflects not only the share of the population that's ageing but also the diversity of long-term care systems in Europe. The Netherlands and Scandinavian countries, for example, have well-developed systems of formal care for older persons, which offer a broad range of government and private-sector services at home or in institutions.

In Central and Eastern European countries, on the other hand, elderly care is largely seen as the responsibility of families. In these countries, as in Mediterranean countries, an elderly person who needs daily care for a lengthy period of time will most likely move in with children or relatives, who provide social support and arrange medical assistance when needed.

“In Central and Eastern European countries, on the other hand, elderly care is largely seen as the responsibility of families.”

This informal care system is facing new challenges in the modern era, too. Women, who around the globe have traditionally played the family caretaker role, are increasingly working outside of the home, further reducing the number of family members available to provide informal care for older persons.

INFORMAL CARE CHALLENGES

Even as they seek to grow their stable of professional long-term care providers, countries are endeavouring to make informal family-based care – which is believed to be more beneficial for older people and exert a lower social cost – more feasible.

In Germany, unpaid caregivers have the option to reduce their working hours with a medium-term paid-leave benefit. In the Czech Republic and Ireland, there are tax exemptions for informal care givers to compensate for their efforts.

This type of support will continue to play an important role in both Western and Eastern European countries. But it also raises questions about quality control. How do countries know that their elderly are being given adequate care? And who monitors their well-being?

Informal caregivers, such as family members and neighbours, generally do not have specialised training, which means that overall they lack skills and knowledge about recognising symptoms and thus, about the type of health-care needed.

As the designated protectors of individual rights and social values, governments still have the obligation to monitor informal care provision and ensure that its elderly citizens are in good hands. Establishing quality-monitoring mechanisms in informal care is itself a formidable challenge.

Today's seniors are not passive in this process. Widespread digitisation of society and higher tech-savviness has given older people better access to information, which may increase their expectations for the quality and type of care they should receive.

“ Governments still have the obligation to monitor informal care provision. ”

FINDING NEW LONG-TERM CARE SYSTEMS

Across Europe, from the wealthy west to the developing east, there are always competing demands for public resources. Any money spent on growing long-term elder care systems could also be used to meet other pressing social needs – launching new public-health or environmental programmes, for example.

In Western Europe, where extensive care structures are already in place, their increasingly hefty price tags will make them difficult to sustain in coming years as the population in need continues to balloon.

Eastern European countries face a different policy dilemma: providing care for elderly relatives takes a considerable toll on family members, and public resources for creating nursing homes and elderly houses remain scarce.

At present, as each country begins to ponder a future in which its population is working less but needing more, it is still unclear whether their paths forward will converge. Europe could respond to its divergent but shared problem with a unified response, perhaps via the European Commission, which executes all European Union programming.

To date, the Commission has begun stimulating cross-country collaboration on elderly care with such supranational platforms as the European Innovation Partnership on Active and Healthy Ageing, a portal that helps institutions, professionals and researchers in the healthcare and ageing field to find training resources, best practices, care models and the like.

This is a relatively small step towards grappling with a region-wide social problem. But one immediate hurdle to working together on care for the elderly is the fact that the European Commission has no mandate over healthcare; every EU member state is free to decide how to arrange its own healthcare provision.

“The Commission has begun stimulating cross-country collaboration on elderly.”

In the past, the EU has responded to the need for coordinating similar national issues such as agriculture, for example, by defining subsidies, regulations and investments for EU countries.

A similarly, common European ageing programme based on the commitment and initiative of individual countries could work too, helping each EU member state construct a context-specific care system that benefits both their oldest citizens and society at large.

August 28, 2017 

“A common European ageing programme based on the commitment and initiative of individual countries could work.”

Disclosure statement:

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HOW THE PLACENTA CAN SHED LIGHT ON HIV MOTHERS AND THEIR BABIES



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IN MANY PARTS OF THE WORLD, THE HUMAN PLACENTA (THE AFTER BIRTH) IS DISCARDED ONCE A BABY IS BORN AND CONSIDERED WASTE. THE FOCUS IS ON THE CHILD AND THE NEW MOTHER.

BUT SCIENTISTS HAVE STARTED TO WAKE UP TO THE FACT THAT THE PLACENTA HAS MANY IMPORTANT CELLS — AND THAT THEY ARE ABLE TO GAIN VALUABLE INSIGHTS INTO A BABY’S DEVELOPMENT BY HARNESSING MODERN TECHNOLOGIES TO UNDERSTAND THIS TRANSIENT ORGAN.

“As an organ placenta plays numerous critical roles.”

A lot is known about the placenta already. It starts to develop a few weeks after the egg has been fertilised and the foetus has started to grow. During the pregnancy, as the foetus grows, the placenta develops into a well-structured and highly specialised organ.

As an organ it plays numerous critical roles. It provides the foetus with oxygen, water and nutrients. It ensures all waste products including carbon dioxide are eliminated and it acts as the conduit for hormones like progesterone and estrogen between the mother and the foetus.

But what still remains a mystery is how it develops in HIV positive pregnant women. Several studies in sub-Saharan Africa have shown that when a mother-to-be has HIV there is a significant likelihood that she'll face challenges. This includes stillbirth, a preterm delivery, delivering a baby that is small for its gestational age or having a baby that dies within the first month. If the baby survives, it is likely to be very ill in its first year of life.

This has led scientists to start looking at the placenta to try and gain insight into the effect of HIV on the time of delivery and the health of the newborn babies.

But accessing the placenta isn't easy. Firstly, it's difficult to study it at various times of the pregnancy because the unborn child is fully reliant on it and any adjustment could negatively affect the baby. Getting access to the placenta is also a very costly and time consuming exercise.

And lastly early onset of HIV treatment for HIV positive pregnant women makes it hard to tell whether its the actual virus or the treatment that alters the placenta.

But as the only link between the mother and child it is the only avenue to understand the baby's development.

All this points to why it's important that novel approaches are used to investigate the link between HIV, treatment regimens, and adverse birth outcomes as well as the effect of HIV on quality of life after birth.

NEXT STEPS

There are several ways the placenta could be evaluated. One way of understanding the placenta's role is to look at its cells. It's home to millions of cells grouped into different cell types. Each cell type plays an important role during pregnancy.

One subset is the regulatory T cells. They regulate how certain systems in the human body function. In a normal setting, these cells should increase in number during pregnancy. Research suggests these cells actually migrate from the mother's blood, towards the placenta to ensure that the fetus remains protected.

Research into blood going into the placenta in HIV infected mothers shows that these cells don't increase as steadily as in healthy uninfected mothers. That means that the baby is less protected.

A second approach is to evaluate the actual structure and size of the placenta. The average weight of a placenta at 40 weeks is between 500 grams and 700 grams. But, in some cases, the placentas of HIV positive mothers are marginally smaller. The placentas from HIV infected mothers have also been found to have increased inflammation, and develop lesions that block blood supply and oxygen. This may be the underlying reason why the newborns are small for their gestational age.

“The average weight of a placenta at 40 weeks is between 500 grams and 700 grams.”

CHALLENGES

There are a number of limitations to studying the placenta.

One of the challenges in studying the placenta of HIV positive women is that most are now treated as soon as their HIV status is known. This makes it very difficult to tease out whether complications are being caused by the HIV virus or the treatment regimen the mother is taking.

Secondly, research is limited because of the complexity and expense involved in carrying out investigations into placentas.

Thirdly, because the unborn child relies on the placenta, it's difficult to study it without compromising the safety of the baby. This means that placentas are usually evaluated during early pregnancy (first trimester), after an elective abortion or miscarriage or late pregnancy (third trimester), when the baby is born. They are seldom studied during the second trimester.

Despite these limitations, the placenta is an organ that can tell a very interesting story. By investigating the placentas of both HIV infected and uninfected mothers, scientists may be able to get a sneak peek into life inside the womb.

February 18, 2018 

Disclosure statement:

*Nadia Chanzu-Ihumi's research
was funded by the AXA Research
Fund*



Dead end.



WHAT'S DRIVING THE WORLDWIDE OBESITY EPIDEMIC?

THE RISE OF OBESITY AROUND THE GLOBE HAS LED THE WORLD HEALTH ORGANIZATION (WHO) TO URGE COUNTRIES TO IMPOSE A TAX ON SUGARY DRINKS, WHICH ARE BLAMED FOR THE SPREAD OF THE EPIDEMIC.



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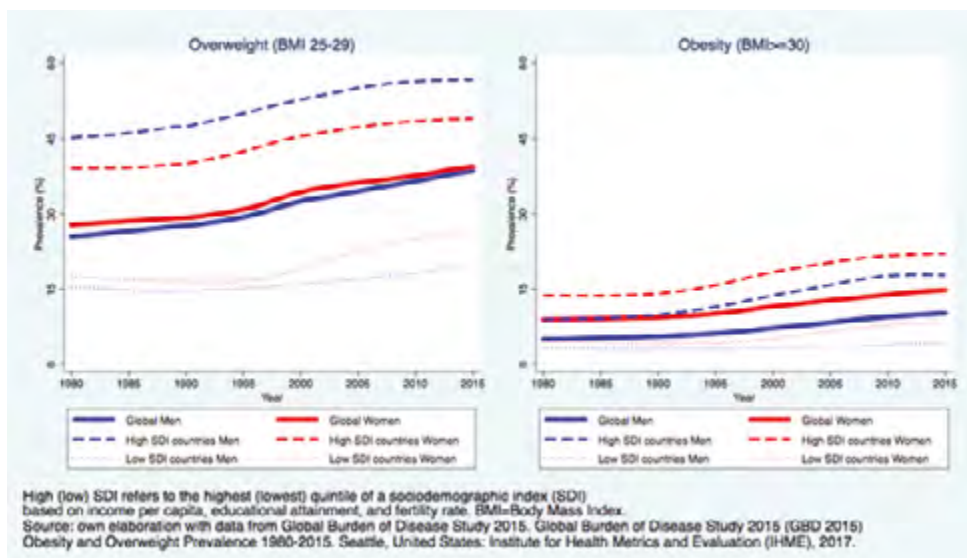
“The proportion of adults who are overweight or obese increased from 29% in 1980 to 37% in 2013.”

Countries with such different food cultures as, say, Mexico and Palau are facing the same nutritional risks and following the same obesity trends. Our research aims to understand why, and we have examined the link between various facets of globalisation (trade, for instance, or the spread of technologies, and cultural exchanges) and the worldwide changes in health and dietary patterns.

A recent global study reports that worldwide, the proportion of adults who are overweight or obese increased from 29% in 1980 to 37% in 2013. Developed countries still have more overweight people than developing nations, but the gap is shrinking. In Kuwait, Kiribati, Federated States of Micronesia, Libya, Qatar, Tonga, and Samoa, obesity levels among women exceed 50% in 2013.

The WHO identifies unhealthy nutrition patterns, along with increasing physical inactivity, as the main drivers of rising body weight around the world. Diets rich in sugar, animal products and fats constitute important risk factors for non-communicable diseases, such as cardiovascular diseases, diabetes, and different types of cancer.

The number of people who are overweight is on the rise.
F. Etile, L. Oberlander, A.-C. Disdier, Author provided



In 2012, cardiovascular diseases killed 17.5 million people, making them the number one cause of death globally. Because more than three quarters of those deaths took place in low- and middle-income countries, causing substantial economic costs for their public welfare systems, the WHO classifies food-related chronic diseases as a growing worldwide threat, on par with traditional public health concerns such as under-nutrition and infectious diseases.

The Western world was the first to experience substantial weight gains of their populations, but the 21st century has seen that phenomenon spread to all parts of the globe. In a widely cited 1993 article, University of North Carolina's Professor Barry Popkin attributes this shift to the "nutrition transition" by which diets became less dominated by starchy staples, fruits, and vegetables and richer in fats (especially from animal products), sugar and processed foods.

The different stages of this transition, Popkin says, are related to social and economic factors, such as industrialisation level, the role of women in the labour force and the availability of food-transforming technologies.

“The Western world was the first to experience substantial weight gains of their populations, but the 21st century has seen that phenomenon spread to all parts of the globe.

THE MEAT FACTOR

The rise of the percentage of the population that's overweight, and changes in diet patterns broadly coincide with the globalisation process. Undoubtedly, globalisation has affected people's lives in various ways, but has it caused a nutrition transition?

In order to answer this question, we have analysed the impact of globalisation on changing dietary patterns and overweight prevalence using data from 70 high- and middle-income countries from 1970 through 2011.

Has the take-up of globalisation had an impact on obesity? F.Étlié, L.Oberlander, A-C.Disdier, Author provided



We found that globalisation has led people to consume more meat products. Interestingly, the social dimensions of globalisation (such as the spread of ideas, information, images and people) are responsible for this effect, rather trade or other economic aspects of globalisation.

For instance, if Turkey caught up to the level of social globalisation prevalent in France, meat consumption in Turkey would increase by about 20%. So our analysis takes into account the effect of rising incomes; otherwise, it could be confounded by the connection between higher incomes making both communication technology and meat products more affordable.

“Globalisation has led people to consume more meat products.”

But while the study shows that globalisation affects diets, we could not establish a relationship between globalisation and increasing body weight. One explanation for this result could be that we investigated the question from a bird's-eye perspective, not taking into account specific circumstances of countries.

So while, on average across the world, globalisation does not seem to be the driver of rising obesity, it may nonetheless play a role in specific countries.

THE PROCESSED-FOOD IMPACT

An alternative interpretation of this unclear result is that other factors are responsible for the rising prevalence of overweight people around the world. For example, increasing consumption of processed foods is often associated with rising weight levels.

A study in the United States showed that Americans derive three quarters of their energy from processed foods, which contain higher levels of saturated fats, sugar, and sodium than fresh foods.

The increasing availability of processed foods is related to the rapid expansion of the retail industry. Modern logistics technology help retailers centralise procurement and inventory, which drives down costs and allows very competitive pricing.

After saturating Western markets, supermarkets began to spread to developing countries, which had greater growth prospects. Latin America, central Europe and South Africa saw their grocery store boom in the 1990s. Retailers later opened in Asia and are now entering markets in African countries.

An interesting, yet little explored, aspect in the discussion of processed foods is the role of multinational companies in offering unhealthy “Western diet”, such as fast food and soft drinks. Multinationals are one of the two market leaders in many emerging countries, including Brazil, India, Mexico, and Russia and they are known for substantial food and beverage advertising.

But it remains unclear whether people gain weight because they adopt a Western diet, or whether they largely preserve their taste for regional cuisines but change the nutritional composition of traditional recipes by adding more meat products, fats, and sugar.

“Americans derive three quarters of their energy from processed foods.”

CHANGING FOOD HABITS: THE ROLE OF LABOUR MARKETS

Apart from these supply-side factors, some studies on US data also associate overweight prevalence with changes in the labour market, particularly the increased participation of women.

But on the one hand, working mothers may have less time to prepare meals or to encourage their children to spend active time outside. And on the other, more working hours are likely to boost family income, which can positively influence children's health through better access to health care, high-quality food, participation in organised sports activities, and higher quality childcare.

Since the decision to work is personal and closely related to individual characters and environment, it is difficult to establish a causal relationship between work status and children's overweight levels. Some studies report a positive effect, but reliable evidence remains scarce. These studies also focus on the role of working women but not on men when there is no evidence indicating a differential impact of working mothers versus working fathers.

People are also increasingly working rotating night shifts. According to a systematic review carried out by the International Labor Organization, about one in five of all employees in the European Union (25%) work night shifts, and night work often constitutes an integral part of the shift-work system.

Such schedules presumably render it more difficult to establish regular meal habits and may encourage frequent snacking to maintain concentration at work. Finally, because modern technology has greatly reduced physical demands of many workplaces, individuals must eat fewer calories to avoid weight gain.

**“Modern
technology has
greatly reduced
physical
demands.”**

While many globalisation-related explanations for obesity seem plausible, robust empirical evidence establishing a causal link is scarce. This is partly due to the fact that food and eating habits have multiple and often interrelated determinants, which makes it challenging to test the causal impact of a single factor. And it's further aggravated by the fact that some of the proposed causes of obesity interact and potentially amplify each other.

Despite initial academic evidence then, the main drivers of the global rise in obesity levels remain, to a large extent, a black box.

December 14, 2016 

“Food and eating habits have multiple and often interrelated determinants.”

Disclosure statement:

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Anne-Célia Disdier received funding from INRA Méta-programmes DID'IT and GLOFOODS.

Lisa Oberlander received funding from INRA Méta-programmes DID'IT and GLOFOODS.



HOW OUR ENVIRONMENT CAN INDUCE ALLERGIES EVEN BEFORE WE'RE BORN



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IS THIS THE WORST NORTHERN HEMISPHERE ALLERGY SEASON YET? FOR MANY PEOPLE — BOTH THOSE WHO'VE SUFFERED BEFORE AND NEWCOMERS TO THE ANNUAL SNIFFLING, COUGHING MESS THAT ACCOMPANIES SPRINGTIME — IT SEEMS LIKE THERE ARE MORE ALLERGENS AND ALLERGIES TODAY THAN EVER BEFORE.

They're not really wrong: allergic diseases are on the rise in the Northern Hemisphere. Nearly one in every two Europeans has either a food or environmental allergy, and both have increased in frequency and severity over the last decade.

Many allergies start in childhood. According to the European Federation of Allergy and Airway Diseases Patients Association around 65% of children are affected by 18 months of age. The International Study of Asthma and Allergies in Childhood reports that well over 20% of European youngsters show allergic reactions to inhalants or food at some point during their childhood.

To learn more about how children become allergic so soon in life, I studied how the environment can affect the risk of developing respiratory allergies (the complete study will be published in coming months in a special issue of the journal *Mechanisms of Ageing and Development* on epigenetics).

ALLERGIES MAY START EVEN BEFORE WE ARE BORN

“What pregnant women eat and breathe can impact their unborn babies.”

Although genetic predisposition is an important risk factor, experts have also known for some time that what pregnant women eat and breathe can impact their unborn babies. The last decade has seen further scientific proof of the link between a mother's diet and lifestyle during pregnancy and the well-being of her child later in life.

Recent results from a Flemish birth cohort study looking at mothers and their children, which was financed by the Flemish Government and coordinated by a leading European independent research and technology organisation VITO, showed an association between exposure to traffic-related air pollutants before birth (mainly nitrogen dioxide and the particle PM10) and the development of asthma symptoms or wheezing in three-year old toddlers.

Thus, we know that chemical exposure before birth may have an impact on a child's allergy risk later in life. Other recent studies offer an explanation for the link: epigenetic DNA methylation changes induced by environmental factors.

Let's break the science-speak down a bit. Our DNA or genetic blueprint determines the way we look and, to some extent, our personality. Epigenetics – that is, all non-genetic modifications “on” genes that do not change the DNA sequence itself – is responsible for the remaining details.

When epigenetic DNA methylation occurs, it means that methyl groups (-CH₃) are added onto the DNA, which affects the way genes express themselves – that is, how they behave.

For instance, mothers-to-be who are exposed to chemical compounds or consume a less-than-ideal diet – like the modern Western diet which is dominated by processed foods that are low in antioxidants but rich in saturated fatty acids – especially during the early stages of pregnancy, can alter the DNA methylation patterns on their babies' DNA, turning some genes on and others off, and consequently increasing the baby's risk of allergies.

Frequent consumption of fruits, vegetables and fish, on the other hand, are associated with a lower prevalence of asthma. And a diet of fish rich in n-3 polyunsaturated fatty acids (also found in nuts, seeds and oysters among other foods) can actually counterbalance the pro-allergenic response.

What's more, a high level of adherence to the so-called “Mediterranean diet” – olive oil, goats' cheese, and fruits, among other foods – early in life appears to protect against the development of allergies in children.

Such epigenetic changes are, to some extent, reversible. Studies show that epigenetic changes causing higher body weight could be reversed by dietary supplementation with essential nutrients such as choline, betaine and folic acid.

“Extreme or chronic exposure, overeating or chemical exposure during pregnancy, leaves a permanent “mark” on the child's DNA.



The addition of methyl groups on our DNA can change our genes' expression. Sabine Langie/VITO, CC BY-ND

“Chemical exposures during pregnancy and early life influence the immune systems and allergy risk later in life of young children.”

But it appears that extreme or chronic exposure, as may occur if there is starvation, overeating or chemical exposure during pregnancy, may alter the epigenetic pattern so intensively that it leaves a permanent “mark” on the child’s DNA.

This marker can be passed on to the next generation, thus increasing their risk of disease even more from the very beginning of life and highlighting the critical importance of prenatal care in raising healthy future generations.

DETECTING RESPIRATORY ALLERGY IN YOUNG CHILDREN

My research at VITO explored the hypothesis that chemical exposures during pregnancy and early life alter the DNA methylation patterns of young children (aged five and 11 years old) and thereby influence their immune systems and allergy risk later in life.

Questionnaires and saliva samples gathered from about 170 mother-child pairs from two different birth cohorts in Flanders (FLEHS1 and FLEHS2) were analysed. Screening of the whole genome DNA methylation patterns of children allergic to respiratory allergens (hay fever, asthma and house dust mite allergy) compared to not-allergic children revealed a list of 27 gene regions that showed a modified DNA methylation pattern and could thus possibly be used to diagnose respiratory allergies.

Interestingly, we observed an association between the altered DNA methylation patterns in three of these genes and exposure to traffic-related air pollutants during pregnancy of mothers as well as during the child’s life until age 11. This suggests that these allergy-related epigenetic changes can be the result of early life exposures to air pollutants.

Since the identified genes have a regulating role in allergic disease reactions, they might be of interest to study for further development of a diagnostic screening tools. If chemical exposures and resulting changes in DNA methylation patterns can be detected early in life, strategies to prevent chemical exposures or the risk to get allergy (or both), particularly in children, could be developed at various levels such as reviewing legislation on air pollution limits or aiming at a better education of prospective parents.

June 2, 2017 

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BIRD FLU: LEARNING LESSONS FROM TRADITIONAL HUMAN-ANIMAL RELATIONS



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Project "Social Representations of Pathogens at the Frontiers between Species"

AXA Project 2012



2016 : BIRD FLU IS BACK. LONDON ZOO HAS SHUT DOWN ITS BIRD ENCLOSURES, AND SOUTH KOREA IS TAKING MORE RESTRICTIVE MEASURES AGAINST THE SPREAD OF A NEW FORM OF AVIAN INFLUENZA, WHICH HAS ALREADY FORCED ITS GOVERNMENT TO CULL 14.5 MILLION CHICKENS AND DUCKS SINCE NOVEMBER 16. ON DECEMBER 13, JAPAN'S HIGASHIYAMA ZOO BOTANICAL GARDENS IN NAGOYA DECLARED THAT THREE BLACK SWANS THERE DIED THIS MONTH FROM THE H5N6 VIRUS.

**“H5N8
is not
transmissible
to humans.”**

In France, following the discovery of 12 outbreaks of the H5N8 virus in domestic poultry and wild birds, the French minister for agriculture raised the flu risk level to “high”, triggering containment measures to protect farms. Several thousand domestic birds have since been slaughtered. To add to the discouragement of farmers in the South West, these measures followed the suspension of a surveillance plan set up last year after similar cases were found.

They had hoped to get business back on track in the lead up to Christmas — the region is famous for its foie gras.

H5N8, which arrived in Europe from Asia in early 2015, is not transmissible to humans but it is highly pathogenic in domestic poultry. Instead of attacking the respiratory system, as the flu virus does in humans, it destroys the birds’ digestive system.

It triggers an epizootic — a disease event involving a species of animal in a specific area — rather than an epidemic, a term that applies only to outbreaks in humans.

However, health authorities fear that H5N8 could cross with H5N1, a virus that affects humans. H5N1, identified for the first time in Hong Kong in 1997, infected poultry farms in the East of France between 2005 and 2007.

It surfaced again in the country’s southwest in December 2015.

**“H5N1
provokes
severe
inflammatory
reactions in
humans.”**

H5N1 causes a zoonosis, meaning it can be transmitted between different species after having spread in an animal reservoir displaying few or no symptoms. The 2009 H1N1 flu pandemic resulted in fewer fatalities than had been feared because the virus passed via swine, rendering it less lethal. H5N1, however, can be transmitted directly from birds to humans.

Due to the great differences between these two host species, H5N1 provokes severe inflammatory reactions in humans, killing two-thirds of infected people.

CROSSING THE SPECIES BARRIER

The flu virus' ability to mutate and cross the species barrier was discovered in the 1960s. The World Health Organization (WHO) now classifies these viruses according to the proteins found on their surface: hemagglutinin (H) and neuraminidase (N), which determine the way viruses enter and exit targeted cells.

Costly precautionary measures were only imposed on farmers worldwide following the emergence of H5N1 in 1997. Since then, billions of birds have been slaughtered, and around 500 people have died of this virus.

How many animals should be slaughtered in order to protect populations against a potential virus pandemic? This cannot be left entirely up to health authorities, who naturally tend to emphasise the risk to humans. When weighed up against a human life, a bird's life counts for little in their eyes.

French agricultural authorities have been in charge of large-scale poultry slaughter since the 1960s. The upsurge in industrial farming, where animals lacking genetic diversity are kept in close quarters, has exponentially increased the risk of infectious diseases. Thus, when the H5N2 virus, highly pathogenic in birds but not transmissible to humans, was discovered in Pennsylvania in 1983, the US Department of Agriculture ordered the slaughter of 17 million poultry.

“ Billions of birds have been slaughtered.”

TRANSMISSION FROM THE WILD TO THE DOMESTIC

What do these precautionary measures mean for farmers? Financial compensation for slaughter is never equivalent to the real market value of the destroyed animals, especially when, as is the case this time, the poultry were bred to produce foie gras, a product with significant added value.

“What do these precautionary measures mean for farmers?”

The psychological impact of these measures must also be taken into account. Not only can they damage the reputation of a farm, or of an entire sector (the US is as quick to denounce the foie gras industry as a neighbour is to criticise a farmer's lack of transparency or cleanliness), but they destroy farmers' emotional investment in the care and conservation of their flock.

Poultry require daily care for selection, feeding, and monitoring. France witnessed an outpouring of empathy from farmers during the slaughter of bovines with suspected spongiform encephalopathy (mad cow disease), which spread through Europe in the 2000s. While we are unlikely to see the same for duck farmers who force-feed their animals, it is still fair to say that these farmers are attached to the birds they have domesticated — that is, taken into their homes (*domus*), according to the root of the word.

Through a project on social representations of pathogens at the frontiers between species, I managed a team of anthropologists who studied how zoonoses are managed outside of France and Europe. The risk of infection from the wild is perceived differently, depending on the kind of attachment people have to their domestic animals.

Zoonoses are the result of pathogens passing from the wild into the domestic sphere. However, the boundary between the two is not fixed and varies in each society based on its relationship to animals.

“The boundary between the wild and the domestic sphere is not fixed.”

In Laos, for example, elephant owners and mahouts do not see their animals as being wild, but rather as companions. They take care of them by calling on their “spirits”. Mahouts work seasonally with their elephants to gather wood in forests and parks. In 2012, cases of tuberculosis were discovered in elephants. Tourists, who enjoy a ride on the back of these quintessentially wild animals, may risk infection.

The owners of infected elephants do not mention these risks when talking to tourists, not only for fear of losing lucrative business, but also because the tuberculosis bacillus is not one of the “spirits” they invoke when caring for their animals.

Likewise, in Australia, the bat is not seen by Aboriginal people as a wild animal living separately from humans. Rather, bats are totemic. Some groups trace their ancestral roots back to them, while others eat them for medical reasons, which explains their frequent representation in indigenous art.

Yet bats are thought to be a reservoir for several zoonoses, such as Ebola, Hendra, Nipah and SARS, due to the great diversity of bat subspecies and their proximity to caves and trees.

Mongolia is another interesting case, because the bulk of its economy relies on raising livestock: bovines, sheep, camels and horses.

The country recently opened up to international flows, exposing it to an increase of zoonotic and epizootic outbreaks, including brucellosis, anthrax, and foot-and-mouth disease. Farmers protect themselves and their animals from these diseases by combining vaccination with traditional shamanic or Buddhist techniques.

In recent years, the Mongolian government has ordered the large-scale slaughter of gazelles living on the Chinese and Russian borders, in order to limit the transmission of pathogens to livestock. But it is now involved in attempts to recognise the value of the knowledge of nomadic shepherds, in partnership with the World Organisation for Animal Health, which would like this knowledge to be registered as world heritage.

The lessons of Laos, Australia and Mongolia could be applied in France and other Western countries. The reluctance of French farmers to apply precautionary measures they have trouble understanding echoes that of police officers who must apply increasingly stringent anti-terrorism measures.

The French state could recognise the value of farmers' work, not only by promoting the label "South-Western foie gras" but, more importantly, by highlighting the traditional practices farmers use to take care of the animals we eat, and the benefits of their vigilance for public health.

December 15, 2016 

“The lessons of Laos, Australia and Mongolia could be applied in France.

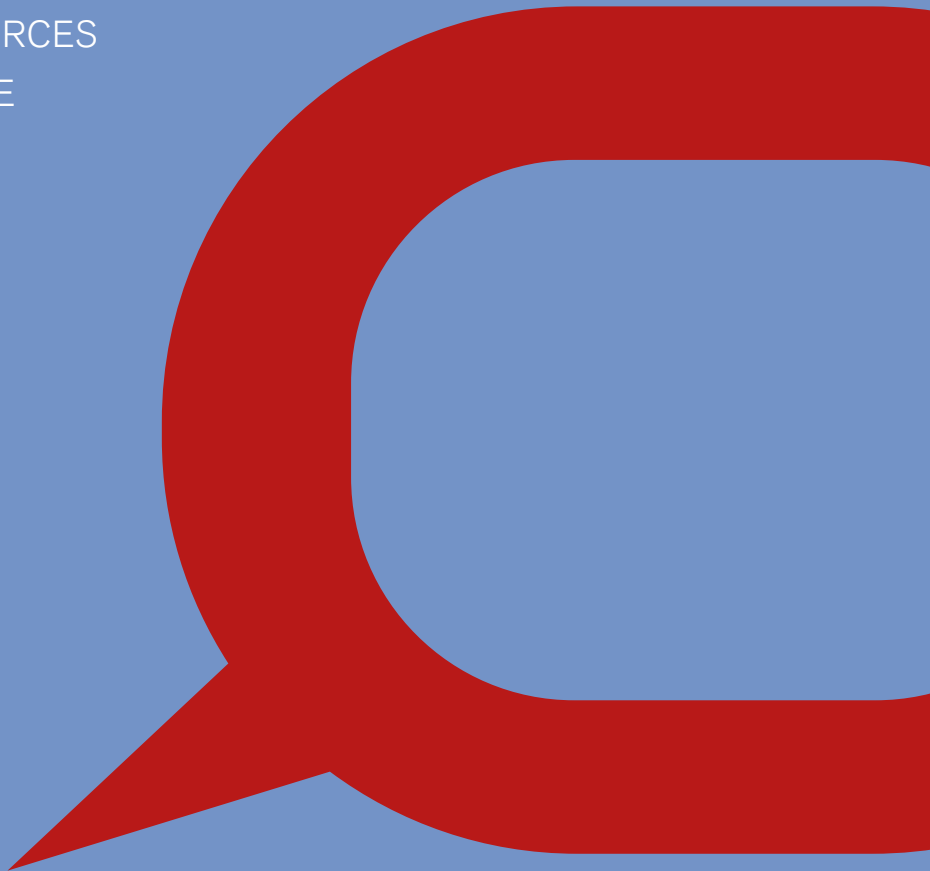
“The French state could recognise the value of farmers' work.

Disclosure statement:

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ENVIRONMENT

- NATURAL RESOURCES
- CLIMATE CHANGE
- EARTHQUAKES
- POLLUTION





'DAY ZERO': FROM CAPE TOWN TO SÃO PAULO, LARGE CITIES ARE FACING WATER SHORTAGES



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WILL SOUTH AFRICA'S SECOND LARGEST CITY DRY UP ON AUGUST 19 OF THIS YEAR? BY LAUNCHING AN OFFICIAL COUNTDOWN, CAPE TOWN CITY COUNCIL WISHED TO HIGHLIGHT THE IMPENDING CUTS TO DOMESTIC WATER SUPPLY FOR ITS MORE THAN 3.7 MILLION INHABITANTS.

The BBC then upped the ante, with an online list of 11 cities that may sooner or later suffer the same fate. Since then, a tide of alarmism has swept through the media. It is as if we are suddenly realizing that water doesn't flow from the tap by magic!

WHAT IS HAPPENING IN CAPE TOWN?

Located on the southern tip of Africa, Cape Town has a distinctly Mediterranean climate. This is why grapes grow so well there. But despite being a boon for winegrowers, that climate is characterized by formidable summer droughts. And with winter ending in the northern hemisphere and summer drawing to a close in the southern hemisphere, now is the time of year when the water reservoirs of Cape Town are typically at their lowest.

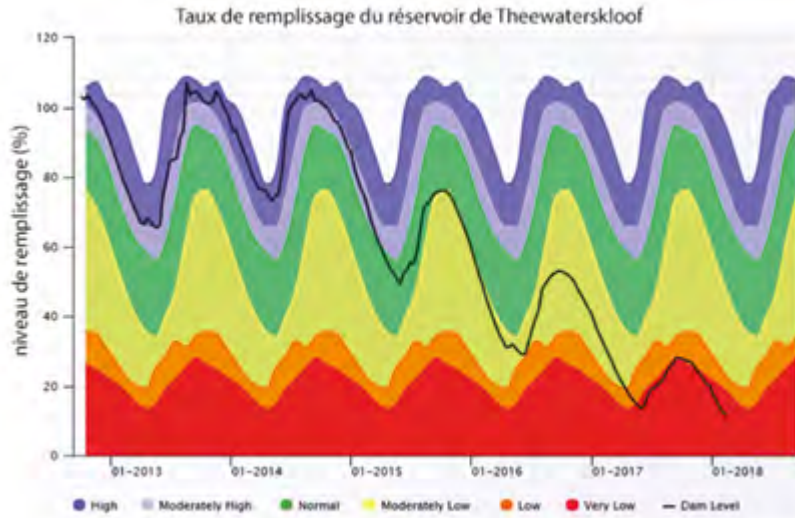
The city has a total of six reservoir dams to store water from rivers running down from the Cape Fold mountains, east of the city. Their total storage capacity is around 900 million cubic meters (for comparison, the storage capacity of the Grands Lacs de Seine reservoirs, upstream of Paris, is 810 million cubic meters).

But Cape Town's current problems are far more serious than a simple seasonal slump: a prolonged drought raging since 2015 means that reservoirs have not been able to recover their reserves over the last three winters (2015, 2016 and 2017), leading to a steady decline in water storage rates (see graph below). Only a significantly premature and rainy winter could now prevent a general water shutdown; even then, it is unlikely that water storage rates will rise to secure levels over the course of one season.

“A prolonged drought raging since 2015.”

CLIMATE IMPACT

This extraordinary crisis is clearly due to climatic causes (an uninterrupted succession of dry years), with aggravating factors, such as high sustained urban population growth (+80% between 1995 and 2018) and water sharing between the city and agricultural land.



Changes in water storage levels at Theewaterskloof dam, the largest of the reservoirs supplying Cape Town with water. South African Department of Water and Sanitation, CC BY.

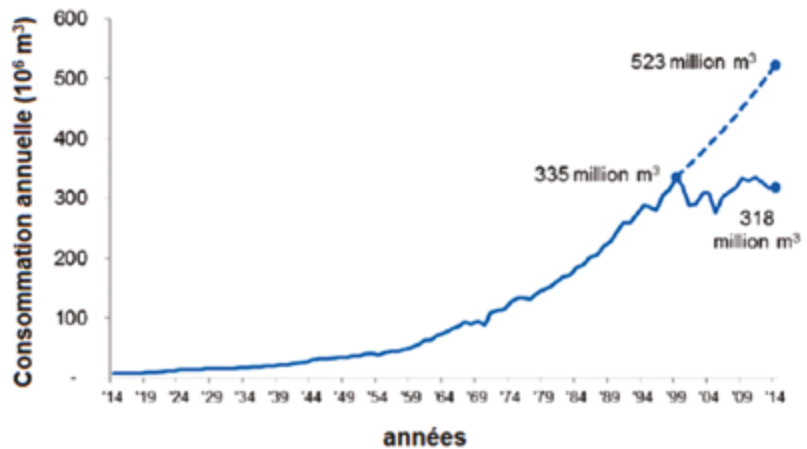
As a matter of fact, the water stored in Cape Town's water supply reservoirs is not only used for drinking water: a third of its volume is used to irrigate the approximately 37,000 acres of vines and orchards that surround the city.

At the turn of the century, the council implemented an active policy for controlling water consumption, stabilizing it at the level reached in 1999, in spite of a significant rise in population (see graph below). The loss rate through leakage in the water distribution network is low (around 15%) and waste water is increasingly being re-used, in particular to water parks and golf courses.

The City has already made plans for a general shutdown, which is now a very serious possibility. Water would be distributed from 200 sites, where inhabitants would be able to collect 25 litres per day, under the surveillance of the army and police.

“Waste water is increasingly being re-used.”

Changes to Cape Town's water consumption over time. Ville du Cap, CC BY.

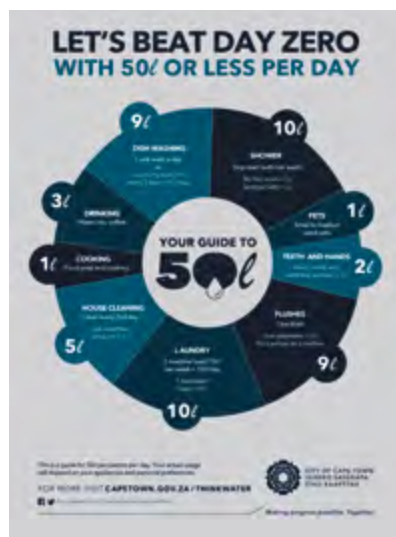


LOCAL OR GLOBAL CRISIS?

Looking beyond South Africa's current troubles, we can wonder whether this crisis is local, or global.

The BBC published a list of eleven cities with recurring water supply problems; other organizations, such as the World Bank and various scientific journals, have published similar lists.

How to live with only 50 litres (13 US gallons) of water a day. Ville du Cap, CC BY.



Numerous regions worldwide have experienced water supply crises in recent years. In 2008, Barcelona was forced to ship in water on tankers and, in 2009-10, Melbourne residents lived under the threat of water cuts following an extraordinarily long drought (1998-2010). The same drought also forced Sydney to implement water restrictions, reducing consumption by 20%.

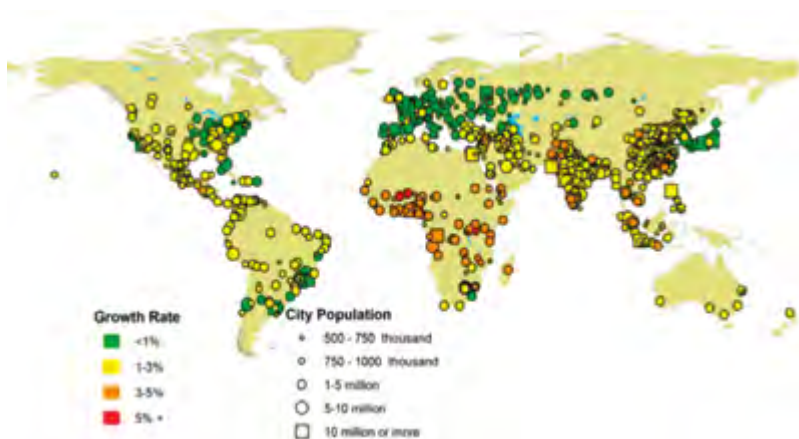
In France, the island of Mayotte nearly had to call in the tankers in 2017, following a very late start to the rainy season.

While Cape Town's extraordinary drought may well be considered a local phenomenon, UN demographic predictions for large cities provide little cause for optimism: current rates of population growth in Africa, Asia and North and South America are such that it is clear that water supply will be a major challenge for big cities in the 21st century (see graph below).

“Numerous regions worldwide have experienced water supply crises.”

THERE ARE SOLUTIONS

Fortunately, there is nowadays a wide variety of long-term solutions to avoid city water supply crises. These range from reducing water consumption to increasing water storage and improving the management of existing resources.



Projected population growth rates for the world's large cities (2014-2030). United Nations, CC BY.

Change consumption habits

Changing city dwellers' consumption habits is the surest way of avoiding water crises. But sociologist Rémi Barbier stresses that this is no easy task. Over the last decade, the French biodiversity agency has launched a number of studies opening up options to reduce water use.

Improve water use management in agriculture

Better irrigation efficiency worldwide is a major step towards water savings. If we reduced the amount of water used for agriculture by just 10%, we could double the drinking water supply. For many years, efforts concentrated on improved irrigation techniques (such as trickle or drip irrigation, which is slowly replacing surface irrigation, where water floods the field). Today, work is being conducted on recycling urban waste water for irrigation.

“ Better irrigation efficiency worldwide is a major step towards water savings.

Improve distribution efficiency

We can save large volumes by reducing water losses in water transport and distribution networks. In France, an average of 25% of drinking water is lost to leaks in the network (this reaches up to 40% in places). While this figure is very high, it should be considered in the context of the size of distribution networks (nearly 850,000 km). Locating and repairing leaks is therefore a lot trickier than it sounds and we cannot hope to eliminate them all. It is however possible to reduce their impact by reducing network pressure at night, for instance, so as to limit losses from existing leaks.

Improve natural flow predictions

In order to optimize the use of surface water, better anticipation of water flows is necessary. Forecasts – in the short-term for high water levels and in the medium- to long term (from a few days to a few weeks or months) for average to low flows – would enable us to better plan water releases and save water. Meteorological and hydrological models are the main tools that will help us better predict these phenomena. In France, a research program on predicting low water levels (Premhyce) will soon lead to an operational forecasting system.

Better manage underground water sources

For large cities that rely on underground water, the main threat to supply is overuse. This is difficult to control, especially because ground water is accessible to a large number of local occupants, who do not always understand the resource they are using. Water management solutions should be adopted collectively: we must control consumption, allocate usage rights and, above all, make sure these rules are upheld by installing meters on wells.

“Water management solutions should be adopted collectively.”

WHAT ABOUT DESALINATION?

One of the solutions often proffered for water shortages is industrial production of fresh water by desalinating seawater (or brackish underground water).

Desalination is on the rise in various Near- and Middle Eastern countries, and in Maghreb. In Mediterranean Europe, it is being developed in Spain (Barcelona, the Canary Islands), Cyprus, and Malta. In France, it remains very rare, but the islands of Sein and Houat (in Brittany) have small desalination plants, as does Mayotte.

But desalination remains a very costly solution (around €0.50 per cubic meter for very large plants) and consumes a great deal of energy (from 3.5 to 18kWh per cubic meter, depending on the technique used).

Melbourne provides an instructive example: the Victorian State government built a seawater desalination plant to supply the city with drinking water. Construction began in 2009, during a drought, when water levels in the reservoirs had fallen to a historical low, but the plant did not become operational until 2012, when the drought had already broken. It did not receive its first order for water until 2017.

The current crisis in Cape Town reminds us that water does not automatically flow from our taps. This modern privilege is under threat from climate hazards and the remarkable growth of cities worldwide. Cities will have to seek out water further afield, and will no doubt come into competition with traditional users, such as farmers.

“Cities will have to seek out water further afield.”

This article was co-written with Jean Margat, a hydrogeology expert.

Translated from the French by Alice Heathwood for Fast for Word

April 29, 2018 

Disclosure statement:

Vazken Andréassian received funding from the AXA Research Fund for his research work.



WHEN CLIMATE COMES UNHINGED, WE NEED TO RE-THINK HOW TO BUILD OUR CITIES



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IN LATE JANUARY 2018, PARIS SEEMED TO BE DROWNING. BOTH THE SEINE AND THE MARNE RIVERS OVERFLOWED FOR THEIR BANKS, FORCING SOME SUBURBAN CITY-DWELLERS TO HAVE TO ROW TO REACH THEIR HOUSES, WHILE THE ICONIC ZOUAVE STATUE ON THE PONT D'ALMA WAS EVEN GIVEN A LIFE-VEST. THAT WAS JUST BEFORE SNOW ENGULFED THE FRENCH CAPITAL.

“Flooding will be a recurrent feature even if we manage to keep global warming below the 1.5 Celsius degree.”

Rising waters in the Lyon region have also been of great concern as well as in the north-east near Strasbourg, where the Rhine river (which also flow through Germany) was extremely high. A new normal? According to research, “flood damage from rivers in Europe will more than double to about 15 billion euros (\$19 billion)” as a result of global warming. Flooding will be a recurrent feature of our regions even if we manage to keep global warming below the 1.5 Celsius degree recommended by the Paris agreements.

Cities in Europe will suffer from heat and heat waves as well as from extreme rainfall which will be a new challenge for planners and health care services. Cities will need to adapt drastically to avoid catastrophes. While reducing carbon emissions is key to tackle the global issue there are various ways to make cities more resilient.

INFORMING PEOPLE

Informing people about approaching heat waves is one important issue. Doing so, all possible information and communication sources should be activated. Apps, social networks such as WhatsApp or Facebook groups can prove handy provided they are used with consistency as explained by social scientists observing social media response to disasters in California.

Use of everyday infrastructure such as supermarkets, pharmacies and cafés can also help. In Vienna, churches opened for tourists and residents during the heat waves in 2015 and 2017.

During catastrophe such as heat waves, dedicated mobile information services should be implemented. It could be helpful for health or social workers to localize older people who are often isolated and more affected by high temperatures. Thousands of senior citizens died in France in the 2003 massive heatwave. In France, “La Poste”, the official public mail service, launched last summer a pilot project. It offers individuals to look after an isolated parent against a compensation.

BLUE AND GREEN CITIES

Greening and blueing cities can also become a new norm when we talk of planning and building.

These practices bring nature back into the built space and make use of its great properties to balance heat and also heavy rainfall by filtration, absorption, percolation and seeping functionality. Open soils in parks, on lawns, in cemeteries or urban gardens are highly suitable for this but also green roofs, rooftop raingardens or green walls. All buffer heat and emit transpiration coolness.

We can think for instance of rain gardens and green houses in Milan, which already proved useful in New York, as they could absorb about 50% of the rainfall.

Revitalized brownfields and their conversion into large public parks and greenspaces can become a hit such as the urban farms set up in the middle of Berlin, Germany, in Edinburgh in the UK, Malmö or Leipzig in Sweden just to list a few. It can also take the shape of bioswales – linear vegetated channels, specifically designed to attenuate and treat storm water runoff.

Trees and forests, in addition, also emit essentials which are good for human's lung function and respiratory power. Thus, green spaces have great synergies to balance heat, heavy rainfall and transport emissions (particles, nitrogen oxides).

Blueing the city means to increase open water surfaces and create areas which can be flooded (in the Seine wetlands for example) or where water can stand. These are the more technological answer in case wetlands or riparian areas are not available or totally embanked.

These practices help build what we call “resilient cities”.

“Bring nature back into the built space and make use of its great properties to balance heat and also heavy rainfall.”

TOWARD RESILIENT CITIES

“Instead of blocking the water think to welcoming it.”

A resilient city in terms of its eco-climatological conditions is a city which takes into consideration what I sketched above and which holds areas for greening and blueing and invests in an excellent and flexible information/communication network.

In addition, complementarities between green, blue and built (grey) infrastructure should be taken into consideration and not mutually ignored. For example, dams are sometimes necessary as bioswales can only take up a certain amount of water.

Beyond technical considerations, we also need to take into account the political aspect of a resilient city : first and foremost, it is a space where citizens should all access the necessary information to mitigate catastrophe, free of charge, as a civil and municipal service.

These basic adaptation practices will complement more technical and green solutions such as flood protection in Vienna or Cologne that proved to be successful in the past years.

For instance, after Germany's disastrous Elbe river floods of the last two decades, dikes were relocated and modified to broaden the natural floodplain and to give the river more room. Yet the dam burst four years ago.

That is why, instead of blocking the water, other cities think to welcoming it. For instance, the city of Hamburg, in the Netherlands has the project to create a new floodplain for river Elbe to restore “some natural balance to a dockland area”, which has been under stress for half a century due to heavy ship traffic.

Of course a large 100-years flood cannot be buffered or balanced by bioswales or lawns along a floodplain; but it can reduce peaks and make flood velocity lower and give people more time to react.

February 8, 2018 

Disclosure statement:

Dagmar Haase received funding from the AXA Research Fund for her research work.





EARTHQUAKES CAUSED BY INDUSTRIAL ACTIVITIES: WHAT ARE THE RISKS AND HOW CAN THEY BE REDUCED?



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AXA Research Fellow 2016



ON SEPTEMBER 3, 2016, A MAGNITUDE 5.8 EARTHQUAKE STRUCK JUST NORTHWEST OF PAWNEE, OKLAHOMA, CAUSING MODERATE TO SEVERE DAMAGES IN BUILDINGS NEAR THE EPICENTER. IT WAS THE LARGEST EVER RECORDED IN THE STATE.

“Some of the largest and more destructive earthquakes of the past few years have been related to man-made activities.”

The Pawnee earthquake followed the dramatic increase of seismic events in the central United States beginning in 2009, associated with the increase of underground wastewater disposal by oil and gas operators. This and other events in the area raised public concerns and led governmental agencies to shut down injection wells and establish new regulations regarding wastewater injections.

While human-caused earthquakes have been documented for more than a century, their increasing number reported worldwide has drawn much scientific, social and political attention. Such earthquakes are related to industrial activities such as mining, construction of water dams, injection of liquids such as waste water and carbon dioxide, and extractions associated with oil and gas exploitation.

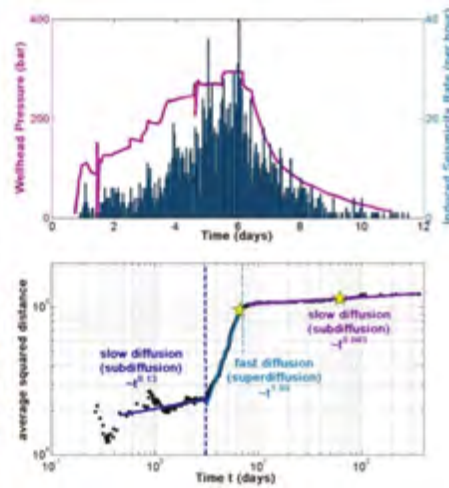
With the ever-increasing demand for energy and mineral supplies worldwide, the number of human-caused earthquakes is expected to rise in the upcoming years. Some of the largest and more destructive earthquakes of the past few years have been related to man-made activities, such as the 2008 magnitude 7.9 Wenchuan (China) earthquake and the 2015 magnitude 7.8 Nepal earthquake.

In most of the cases industrial activities do not induce earthquakes. But this becomes problematic when such activities are close to active faults. In this case, even small stresses underground caused by man-made activities can destabilise faults, inducing earthquakes.

FAULTY FLUID INJECTIONS

Such stresses, such as fluid injections, are even capable of migrating long distances in the planetary crust, can induce earthquakes days, months or even years after the injection.

The above figure shows that as fluid pressure at the top of the well Basel 1 (purple line) was increasing during injection, the induced seismicity rate also increased (bluish bars). In the bottom figure, the average squared distance of the induced earthquakes from the well is shown, which indicates the complex propagation of seismicity away from the well over time. The largest-earthquakes (magnitude greater than 3, shown with stars) occurred after the injection ended.



Drilling site in the city of Basel, Switzerland. Georgios Kefalas/ Giorgos Michas, Author provided

Such problems, along with the general lack of knowledge of the exact stress and faulting conditions below ground, make such earthquakes difficult to forecast or manage.

In Europe, where the population density is higher than the United States, public concern over man-made earthquakes is greater. In the well-known case of Basel, Switzerland, which took place in 2006, approximately 11,500 cubic metres of water were injected at high pressure into a 5-km deep well to make the extraction of geothermal energy possible. During the injection phase, more than 10,000 earthquakes were induced, including some strong events that were felt in Basel itself. These raised public concern and anger, leading to the termination of the project and to more than \$9 million on damage claims.

“In Europe, public concern over man-made earthquakes is greater.”

NATURE'S WORK

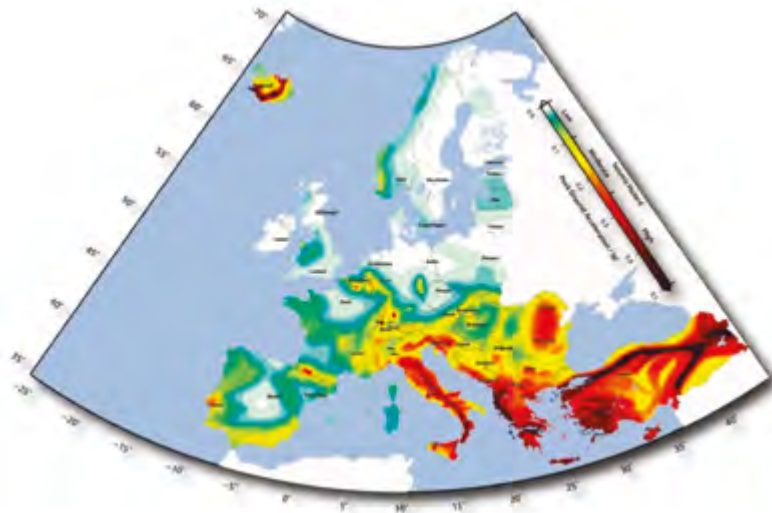
In Southern Europe, which has a higher risk of natural occurring earthquakes, public tolerance on induced earthquakes due to industrial activities is even more limited. The deadly 2012 Emilia (Italy) earthquake sequence became a topic of sustained public debate and political discussion, based on the proximity of the earthquake epicentres to an oil field.

“In Southern Europe, public tolerance on induced earthquakes due to industrial activities is even more limited.”

The Italian government established an international committee to investigate, and while no clear link between regional seismicity and oil-extraction was found, one wasn't excluded either. Other studies concluded that the earthquakes were a natural event.

Another recent case is that of the Castor project, an underground offshore gas-storage facility in the Gulf of Valencia, Spain. The US\$2 billion project was terminated by the Spanish government in 2014 following a burst of regional seismicity immediately after the initiation of gas-injection operations, and the public concern that followed.

The above European Seismic Hazard Map displays the most seismically hazardous areas in Europe measured by the peak ground acceleration (PGA) that may be expected during an earthquake, with a 10% probability to be reached or exceeded in 50 years. Green indicates comparatively low hazard values of PGA below 0.1g; yellow to orange show a moderate hazard, between 0.1-to-0.25g; and red identify high-hazard areas with PGA of more than 0.25g.



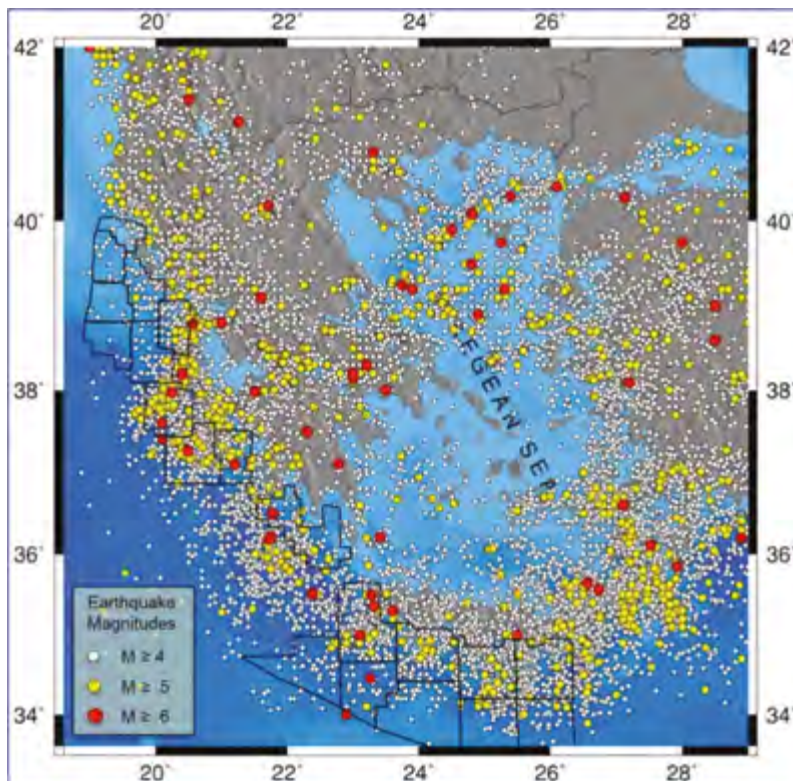
European Seismic Hazard Map. Giorgios Michas, Author provided

THE CHALLENGES AHEAD

The previous cases illustrate some of the coming challenges to be faced with man-made earthquakes. The ability to distinguish between natural and human-induced earthquakes can be difficult or even impossible, especially in seismically active regions, while in other cases the risk associated with industrial activities is significantly underestimated. Such problems pose novel challenges for risk mitigation and economic growth, especially in seismically active regions such as Southern Europe.

The image above illustrates the drilling and extraction operations may take place near or within seismically active regions, increasing the risk of activating faults and/or accelerating the occurrence of earthquakes that would otherwise would occur naturally sometime in the future.

“The risk associated with industrial activities is significantly underestimated.”



Map showing 50-year seismicity in Greece for moderate- and large-magnitude earthquakes and the regional blocks that have already been or will be licensed for gas and oil exploration and exploitation. Giorgos Michas, Author provided

“Regulations are required.”

To significantly reduce such hazards, regulations are required that include hazard modelling as well as assessment before and during industrial activity that might perturb regional stress fields. Such regulations were recently issued in North America, including California, Oklahoma, Ohio and Texas, as well as in Canada. In Europe, the EU has not yet issued any such regulations, but guidelines have been put forth in some countries that have experienced induced earthquakes, including the Netherlands, Switzerland, the UK, Germany, France and Italy.

In addition, communication campaigns that will inform the public on the economic benefits and the risks that such industrial operations may have, should also put forth. Such measures will assure the effective mitigation of the associated risk and the sustainability of the industrial project.

November 6, 2017 

Disclosure statement:

*Georgios Michas receives funding
from the AXA Research Fund.*





COMMUTING BY SUBWAY? WHAT YOU NEED TO KNOW ABOUT AIR QUALITY

FOUR MORE MAJOR INDIAN CITIES WILL SOON HAVE THEIR OWN METRO LINES, THE COUNTRY'S GOVERNMENT HAS ANNOUNCED. ON THE OTHER SIDE OF THE HIMALAYAS, SHANGHAI IS BUILDING ITS 15TH SUBWAY LINE, SET TO OPEN IN 2020, ADDING 38.5 KM AND 32 STATIONS TO THE WORLD'S LARGEST SUBWAY NETWORK. AND NEW YORKERS CAN FINALLY ENJOY THEIR SECOND AVENUE SUBWAY LINE AFTER WAITING FOR ALMOST 100 YEARS FOR IT TO ARRIVE.



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“In Europe alone, commuters in more than 60 cities use rail subways.”

In Europe alone, commuters in more than 60 cities use rail subways. Internationally, more than 120 million people commute by them every day. We count around 4.8 million riders per day in London, 5.3 million in Paris, 6.8 million in Tokyo, 9.7 million in Moscow and 10 million in Beijing.

Subways are vital for commuting in crowded cities, something that will become more and more important over time – according to a United Nations 2014 report, half of the world’s population is now urban. They can also play a part in reducing outdoor air pollution in large metropolises by helping to reduce motor-vehicle use.

Large amounts of breathable particles (particulate matter, or PM) and nitrogen dioxide (NO₂), produced in part by industrial emissions and road traffic, are responsible for shortening the lifespans of city dwellers. Public transportation systems such as subways have thus seemed like a solution to reduce air pollution in the urban environment.

But what is the air like that we breathe underground, on the rail platforms and inside trains?

MIXED AIR QUALITY

Over the last decade, several pioneering studies have monitored subway air quality across a range of cities in Europe, Asia and the Americas. The database is incomplete, but is growing and is already valuable.

For example, comparing air quality on subway, bus, tram and walking journeys from the same origin to the same destination in Barcelona, revealed that subway air had higher levels of air pollution than in trams or walking in the street, but slightly lower than those in buses. Similar lower values for subway environments compared to other public transport modes have been demonstrated by studies in Hong Kong, Mexico City, Istanbul and Santiago de Chile.

OF WHEELS AND BRAKES

Such differences have been attributed to different wheel materials and braking mechanisms, as well as to variations in ventilation and air conditioning systems, but may also relate to differences in measurement campaign protocols and choice of sampling sites.

Key factors influencing subway air pollution will include station depth, date of construction, type of ventilation (natural/air conditioning), types of brakes (electromagnetic or conventional brake pads) and wheels (rubber or steel) used on the trains, train frequency and more recently the presence or absence of platform screen-door systems.

In particular, much subway particulate matter is sourced from moving train parts such as wheels and brake pads, as well as from the steel rails and power-supply materials, making the particles dominantly iron-containing.

To date, there is no clear epidemiological indication of abnormal health effects on underground workers and commuters. New York subway workers have been exposed to such air without significant observed impacts on their health, and no increased risk of lung cancer was found among subway train drivers in the Stockholm subway system.

“The ferrous particles are driven through the tunnel system.”



Under construction of the 2nd Avenue subway line, New-York, 2013. MTA Capital Construction/Rehema Trimiew/Wikimedia, CC BY-SA

But a note of caution is struck by the observations of scholars who found that employees working on the platforms of Stockholm underground, where PM concentrations were greatest, tended to have higher levels of risk markers for cardiovascular disease than ticket sellers and train drivers.

The dominantly ferrous particles are mixed with particles from a range of other sources, including rock ballast from the track, biological aerosols (such as bacteria and viruses), and air from the outdoors, and driven through the tunnel system on turbulent air currents generated by the trains themselves and ventilation systems.

COMPARING PLATFORMS

The most extensive measurement programme on subway platforms to date has been carried out in the Barcelona subway system, where 30 stations with differing designs were studied under the frame of IMPROVE LIFE project with additional support from the AXA Research Fund.

It reveals substantial variations in particle-matter concentrations. The stations with just a single tunnel with one rail track separated from the platform by glass barrier systems showed on average half the concentration of such particles in comparison with conventional stations, which have no barrier between the platform and tracks. The use of air-conditioning has been shown to produce lower particle-matter concentrations inside carriages.

In trains where it is possible to open the windows, such as in Athens, concentrations can be shown generally to increase inside the train when passing through tunnels and more specifically when the train enters the tunnel at high speed.

MONITORING STATIONS

Although there are no existing legal controls on air quality in the subway environment, research should be moving towards realistic methods of mitigating particle pollution. Our experience in the Barcelona subway system, with its considerable range of different station designs and operating ventilation systems, is that each platform has its own specific atmospheric micro environment.

To design solutions, one will need to take into account local conditions of each station. Only then can researchers assess the influences of pollution generated from moving train parts.

Such research is still growing and will increase as subway operating companies are now more aware about how cleaner air leads directly to better health for city commuters.

September 15, 2017 

“Take into account local conditions of each station.”

Disclosure statement:

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PEOPLE POWER: HOW COMMUNITIES AND CITIES CAN HELP SAVE THE ENVIRONMENT



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A YEAR AFTER COP21 AND THE ADOPTION OF THE PARIS AGREEMENT, INTERNATIONAL POLICYMAKERS ARE STILL STRUGGLING TO CONVERT TARGETS INTO ACTION. THIS IS CLEARLY INDICATED BY THE TITLE OF THE RECENT FOLLOWUP COP IN MARRAKECH: TURN THE PROMISE OF PARIS INTO ACTION.

But as the international community putters along, cities and local communities are already staking out the front lines of the fight against climate change.

CITIES TAKE THE LEAD

“The first city-level cap-and-trade system for buildings’ energy efficiency.”

Over the years, sub-national actors, such as cities and regions, have acquired increasing weight in international negotiations. Policymakers and scholars alike acknowledge cities’ vulnerability to, and share of responsibility in, environmental degradation. As the recent C40 Mayors Summit in Mexico City demonstrated, mayors of the world’s metropolises are also interested in creating low-carbon and resilient urban futures.

Because local governments control key sectors of environmental policy, and have high concentrations of people, economic activity and political clout, cities are a necessary well positioned to design innovative climate change solutions.

In Tokyo, for example, the metropolitan government set up the first city-level cap-and-trade system for buildings’ energy efficiency. If the biggest energy-using facilities fail to meet specified targets, they must buy credits from compliant buildings that can sell their surplus credits.

In South Korea, Seoul’s Station 7017 Project will convert an old elevated road into a pedestrian path that connects the city centre to other districts and to Seoul train station. This will not only help revitalise certain city districts, it will also add green space to this dense metropolitan area.

“An ambitious plan to make the city car-free.”

Then there’s the German city of Hamburg. It is implementing an ambitious plan to make the city car-free within 20 years by developing a major green network of bike and pedestrian paths that link the city to its periphery, as well as to parks, playgrounds, cemeteries and other public spaces. In addition to making cars unnecessary, the greenways will improve resilience to floods and natural disasters, and absorb more carbon dioxide.

PEOPLE POWER

People have immense power to tackle climate change. And this is true especially in the vital energy sector. As scholarly literature has demonstrated, “community power” – fostering citizen participation in renewable energy projects – eases their implementation, reduces energy demand, and may ultimately reduce greenhouse gases.

This idea was the inspiration for the recent World Community Power Conference, held in Fukushima, Japan from November 3 to 4, the same time as the Paris Agreement’s ratification. At the event, which was the first of its kind, participants from academia, local government, civil society, business and even schools explored how communities can be agents for increasing sustainability at the local level.

Organised by the Japan Community Power Association, the Institute for Sustainable Energy Policies and the World Wind Energy Association, the attendees addressed topics from energy democracy and regional cooperation to community power’s value for developing countries. Barriers to cooperation between local governments, citizens and business were also tackled.

Fukushima, where a 2011 earthquake and tsunami caused a nuclear plant meltdown, was a highly symbolic host location. In the aftermath of that disaster, local leaders decided to adopt the target of having 100% renewable energy by 2040. To do so, residents, businesses and local governments are working together to make solar and wind their primary energy sources.

This collaboration takes the form of several community projects. In the Fukushima Airport Solar Power Project, citizens were partial financial investors) in the purchase and installation of solar panels to provide about 1.2 megawatts of electricity to the airport. Another initiative within the prefecture, the Fukushima Ryozen Citizens’ Joint Power Plant, also used citizen funds to help local farmers install a solar farm. It provides about 50 kilowatts of power.

Community power, then, is one way to enhance renewable energy use and phase out fossil fuels. Because it also entails stronger energy security, it necessarily emphasises democratic engagement and local autonomy. Community power may also carry such significant socioeconomic benefits as job creation, community well-being, new revenue sources, solutions to fuel scarcity or even lower energy tariffs.

**“Having
100%
renewable
energy by 2040.”**

JUST WHAT IS COMMUNITY POWER?

There is no common definition of community power but, at a basic level, it implies citizen participation in the production and use of a sustainable energy system, with some degree of control over the activity.

When citizens have ownership – at least partial – of renewable energy plants, by for instance, holding shares in a cooperative, that's community power. If citizens participate in the planning, installation and operational decisions of an energy company, by exercising strategic voting rights as board members, for example, that, too, constitutes community power.

And communities that receive the socioeconomic benefits of their energy sector when the benefits of the company are reinvested in the activity, also have such power.

In such scenarios, citizens cease to be mere consumers and become producers as well as consumers. This broad definition expands the range of forms community power could include. And that's important because local particularities as well as numerous legal and policy obstacles remain powerful barriers to developing community power.

Sharing local experiences also helps other communities forge paths forward. For instance, in Denmark, a law makes it mandatory for consumers or municipal cooperatives to own district heating. The same provision previously applied to electricity production, and when the European energy market liberalised rules so that private competitors began operating in the renewable energy sector, locals protested. The episode highlights how citizen involvement can facilitate the development and embrace of renewable energy projects.

It also shows how strategically structuring the energy market will be important to growing sustainable systems. The recent Clean Energy for all Europeans package, which supports the idea that “consumers are active and central players in the energy markets of the future”, seems well informed by the market side of community power.

**“Citizens
become
producers
as well as
consumers.”**

THE FUKUSHIMA DECLARATION

The declaration that emerged from Fukushima meeting – For the future of the earth – intends to make community power the “prevailing model of the future renewable energy supply all over the world”.

To meet that goal, participants committed to enhancing communication around best practices, working with local governments on renewable energy-focused master plans and engaging in politics nationally and internationally to facilitate the right development conditions. They will also seek to promote community power in developing countries through knowledge transfer.

This declaration is, of course, a soft instrument; it cannot legally compel action. Still, it sheds light on important intersections between people and politics in the fight against climate change. Community power efforts will not only be key to meeting the Paris Agreement objective of staying below a 2°C temperature rise over pre-industrial levels, it may also make governance structures more democratic.

The trend towards energy decentralisation in many countries is a good example of where it can have a big impact. As early as 2010, international development agencies were highlighting the contribution that a decentralised energy system could make to meeting the UN Millennium Development Goals.

By delegating power governance to the sub-national level, decentralisation brings control of important resources much closer to citizens. That change gives cities a chance to innovate at the grassroots level, rather than leaving it to wealthy communities with the resources to undertake ambitious energy programmes.

If the Fukushima meeting was an instance of the early stage of community power getting organised, the coming years will be key to proving its scalability and universality. Planned to be held in Mali, the next conference will take place on a continent where socioeconomic development and energy security are just as important as tackling the global challenge of climate change.

“To make community power the “prevailing model of the future renewable energy supply all over the world”.

December 15, 2016 

Disclosure statement:

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**RUE
BARRÉE**

IN PARIS, THE RISK OF FLOODING IS NEVER FAR AWAY

IN 1910, PARIS WAS SUBJECT TO A HISTORIC FLOOD THAT IS STILL REMEMBERED, AND IT'S FAR FROM A UNIQUE EVENT. IN FRANCE, THE RISK OF FLOODING IS THE NUMBER-ONE NATURAL HAZARD, AFFECTING ONE IN FOUR PEOPLE, OR 17 MILLION RESIDENTS.



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Rising river levels are a natural phenomenon that can lead – depending on their intensity (height, speed), duration and geographical reach – to overflow flooding (where the river breaks its banks), and half of all floods are linked to water runoff.

RISK, HAZARD AND VULNERABILITY

Flood risk, flood hazard, and flood vulnerability: in everyday language, these terms are often used synonymously, although each has its own precise definition:

- A flood hazard is a **hydrological concept** referring to rising river water levels.
- Flood vulnerability is a **sociological concept** related to the damage flooding would cause in a given area. For example, a field or a forest might have low vulnerability, since vegetation can easily tolerate being submerged for short periods of time. However, if an electrical goods store is built on the same site, its level of vulnerability would increase significantly.
- Flood risk is a combination of **hazard and vulnerability**. An extraordinary flood caused by a remarkable rise in water levels in an uninhabited area presents no risk, since there is no vulnerability. On the other hand, a relatively moderate flood in a shopping centre would have severe economic consequences and therefore present a high level of risk.

These concepts enable us to establish water level alert thresholds (yellow, orange, red), corresponding to rising levels of danger, for a given point on a waterway.

HOW ARE WATER LEVELS MONITORED?

In France, the national flood forecast network monitors more than a thousand points across the major waterways. Made up of regional flood forecast services (*Services de prévision des crues* or *SPCs*) and a central service (*Service central d'hydrométéorologie et d'appui à la prévision des inondations*, or *SCHAPI*) run by the Environmental Department, this network uses flood forecasting models to predict hazards a few hours or days in advance, depending on the effectiveness of the catchment basins.

Some – such as GRP and AÏGA developed by the IRSTEA research institute and used in many regional SPCs – are hydrological models. These use information provided by Météo-France on the amount of rainfall that has already occurred, as well as the expected rainfall for the hours or days to come, to predict future water flow in the river. Forecasts from these models can then be used by hydraulic models to simulate the movement of flood waves upstream.

Depending on these forecasts, risk levels are allocated for different stretches of river and published in real time on www.vigicrues.gouv.fr, along with the corresponding weather reports.

“ Flood forecasting models to predict hazards.

HOW CAN WE BETTER PROTECT OURSELVES?

To better protect ourselves from flooding, we can try to mitigate either hazards or vulnerability. To reduce hazards, we can attempt to store some of the water in an upstream reservoir or flood channel so as to spread out the volume of floodwater over time (this means attenuating the peak flow).

To reduce vulnerability, we can either avoid building sensitive infrastructure (hospitals, schools, etc.) on the flood plains of rivers, protect the affected zones (using dykes), or warn populations with sufficient notice.

To act in time, we need both hydrological forecasting (with predictive models) and appropriate organization, as demonstrated by the Sequana exercise that was held in Paris on March 7-18, 2016.

“ Mitigate either hazards or vulnerability.

“The city would see similar scenario to that of the great flood of 1910.

SHOULD WE BE CONCERNED ABOUT POTENTIAL MAJOR FLOODING EPISODES?

That year, weather conditions led to significant rises in water levels in the Loing valley and in small Ile-de-France waterways (the Yvette), and slightly smaller rises in the Yonne and the Brie rivers (the Grand and Petit Morin, and the Yerres). The upper basins of the Seine and Aube were less affected. There was therefore only one basin contributing to the rising water levels in Paris in 2016, so it was unlikely that the city would see similar scenario to that of the great flood of 1910.

AN EXCEPTIONAL MONTH OF MAY?

While the timing is unusual, the situation in 2016 was not completely unexpected. Historically, the Seine in Paris has flooded in winter (in January 1910, 1924 and 1955, and in February 1945). However, this does not necessarily have to be the case. Other bodies of water, also subject to oceanic conditions, have seen major floods in the spring, as the Loire did in June 1856. In May 2013, a fairly similar (although more localised) event also affected the Yonne basin.

Although Paris broke the rainfall record for May in 2016 (176mm, up from the previous record – 132mm – in 1992), it should be remembered that May is generally a rainy month and, generally the rainiest month of the year in Paris.

Translated from the French by Alice Heathwood for Fast for Word

June 1st 2016 

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WHY OZONE LEVELS POSE A CHALLENGE TO FOOD SECURITY

OZONE IS A WELL-KNOWN AND INTERESTING GAS. IT IS THOUGHT OF AS A “GOOD” GAS WHEN PRESENT IN THE STRATOSPHERE, WHERE IT FORMS THE OZONE LAYER SITTING 15 TO 30 KILOMETRES ABOVE EARTH THAT PROTECT LIFE FROM DETRIMENTAL ULTRAVIOLET RADIATION.

BUT WHEN PRESENT IN THE LOWEST ATMOSPHERIC LAYER — THE TROPOSPHERE, WHICH EXTENDS 8 TO 14 KILOMETRES ABOVE EARTH — OZONE BECOMES A CONCERN FOR HUMAN AND PLANT HEALTH.



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“Ozone becomes a concern for human health.

“North American emissions can affect ozone-induced yield losses in Europe.

It is also the third most important greenhouse gas after carbon dioxide and methane. There's substantial evidence that ozone is one of the most phytotoxic (toxic to plants) air pollutants, causing significant damage to agricultural crops worldwide.

A COMBINATION OF POLLUTANTS

This is partly because ozone is a secondary air pollutant: it is not emitted directly, but is formed when other primary pollutants – mainly oxides of nitrogen (NO_x), carbon monoxide (CO) and volatile organic compounds (VOC), which are emitted mainly from the burning of fossil fuels in transport, industry and power generation – undergo photochemical reactions under sunny conditions.

Several hours are required for these photochemical reactions to occur, meaning that ozone concentrations are often higher downwind of urban and industrial centres.

Some important agricultural regions located close to urban and industrial centres experience elevated ozone concentrations, these include the Midwestern USA, much of mainland Europe, the South Asia's Indo-Gangetic plains, and the coast of China.

In these regions, ozone concentrations frequently become high enough to affect crop physiology, growth and yield. Hemispheric transport of ozone and its precursors can also occur so that emissions in one continent influence concentrations in another, for example, North American emissions can affect ozone-induced yield losses in Europe.

Ozone enters plant leaves through stomata – pores that facilitate gas exchange – where it reacts with cellular components, producing a series of chemical reactions that create strong oxidative stress. Damage ranges from visible leaf injuries such as yellowing (chlorosis) and stippling and localised cell deaths (necrosis), to subtle physiological changes such as reduced photosynthesis and premature senescence. These effects ultimately reduce crop yields.

A GROWING CONCERN

Ozone levels have doubled since pre-industrial times due to anthropogenic emissions. Because of stringent air-quality controls, peak ozone levels have declined over the last few decades in Europe and North America. However, the “background ozone”, which is the ozone concentration in absence of local anthropogenic sources, has been increasing over the past few years globally.

In developing countries, especially South and East Asia, ozone levels are rising and this trend will continue at least until 2030 unless emissions of ozone precursors (NO_x and VOCs) are reduced significantly.

It is important to note that regions experiencing high current and future ozone levels also hold a prominent position in global agriculture and food production and are vulnerable to food insecurity.

China and India are important examples of countries where ozone pollution already threatens crop production. In India, up to 14 and 6% yield losses in wheat and rice, respectively, are estimated to have been caused by ozone.

“China and India are important examples of countries where ozone pollution already threatens crop production.”

FAR-REACHING SOCIOECONOMIC IMPLICATIONS

Ozone thus adds yet another factor to the existing nexus of poverty, malnourishment and climate-change effects that challenge food and nutrition security in some of these regions. It is also important to consider that instability of these food systems will have far-reaching socioeconomic implications via changes in food prices, farm incomes, consumer behaviours and nutritional access for different groups of society, including women.

Studies indicate that crop losses due to environmental factors often hit farmers by increasing debts and intensifying workloads as well as altering gender relations.

At the same time, closing the yield gaps in existing and future agricultural regions is essential for global food security.

Farmers and policymakers often fail to identify air pollution as a contributor to lower crop yields and air quality concerns remain

“Air pollution as a contributor to lower crop yields.”

focussed on cities and urban centres where elevated pollution impacts human health. Therefore, it is important that media, scientists and environmental activists take a lead to reach out to farmers, public and policymakers, and provide them with evidence of risk and damage and cooperate in understanding where solutions are required to abate ozone pollution and its consequences.

INTEGRATING OZONE POLLUTION

Recognising these challenges, scientists should consider integrating ozone pollution in seasonal crop-yield forecasts. Researchers at Stockholm Environment Institute are developing ozone risk and damage assessment tools for crops. A recent report highlights the importance of ozone-monitoring networks in rural areas for assessing background ozone concentrations and the frequency of high ozone episodes.

This is particularly important because air-quality monitoring is generally focused on urban and semi-urban areas. This report synthesised information from 15 ozone-monitoring networks over the world, including the European Monitoring and Evaluation Programme, along with data collected by individual researchers or smaller regional to national networks.

Such networks will allow integration of information on ozone pollution with the potential to provide early warnings of ozone episodes (which can often last for days to weeks) helping farmers to minimize crop loss through suitable management practices.

Research to develop resilient agricultural systems would ideally integrate adaptation to avoid the worst effects from ozone pollution alongside climate change through improved crop breeding and agronomic practices. However, it is an absolute necessity to understand the linkages and interactions between air quality, climate change, agriculture, food supply, and associated socio-economic implications at the local, regional and global scale to generate a complete picture of the problem and thereby offer effective solutions.

Disclosure statement:

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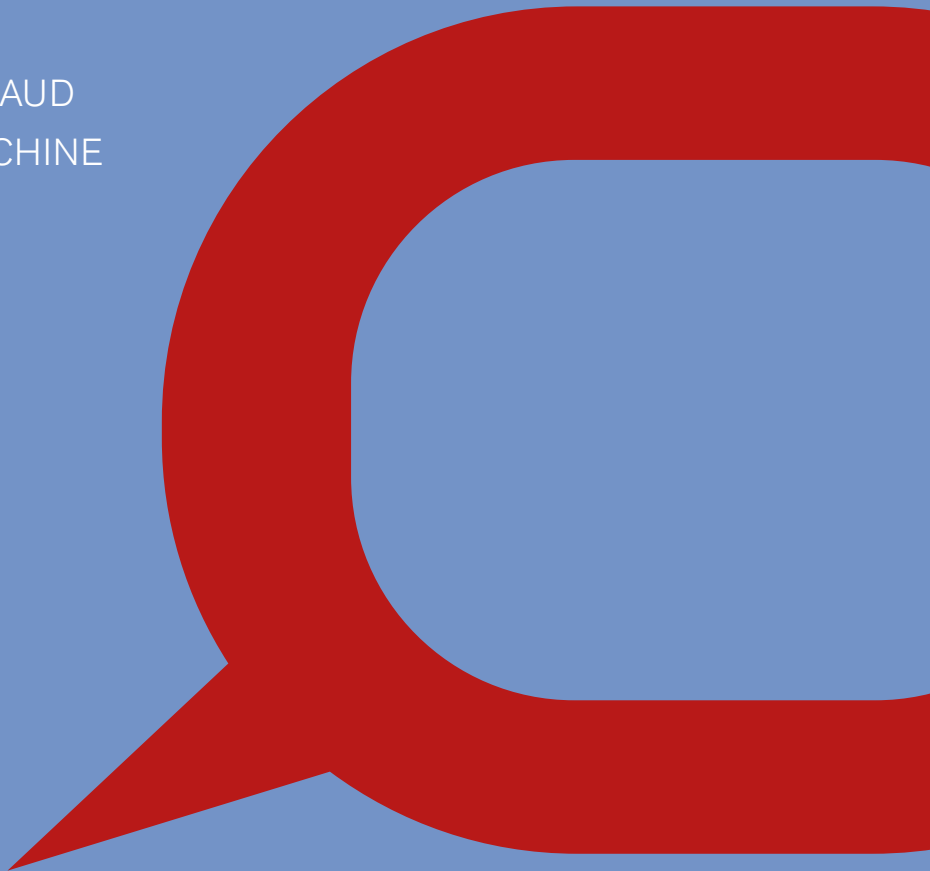
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April 4, 2018 

NEW TECHNOLOGIES

- DATA SECURITY
- CREDIT CARD FRAUD
- HUMAN AND MACHINE





WHY WE NEED TO IMPROVE CLOUD COMPUTING'S SECURITY



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DO YOU OFTEN USE FACEBOOK? HOW ABOUT SNAPCHAT, GMAIL, DROPBOX, SLACK, GOOGLE DRIVE, SPOTIFY OR MINECRAFT? PERHAPS ALL OF THEM? BOTTOM LINE, IF YOU USE AN ONLINE SOCIAL NETWORK, E-MAIL PROGRAM, DATA STORAGE SERVICE OR A MUSIC PLATFORM, YOU ARE ALMOST CERTAINLY USING CLOUD COMPUTING.

Cloud computing is way of giving access to shared resources such as computer networks, servers, storage, applications and services. Individuals and organisations can place their data on the cloud and enjoy unlimited storage free or at a relatively low cost. It also allows services such as email to be offloaded, reducing companies' development and maintenance costs.

DATA BREACHES HAPPEN EVERY DAY

Despite the tremendous benefits of cloud computing, the security and privacy of data are probably the biggest concerns that individuals and organisational users have. Current efforts to protect users' data include measure such as firewalls, virtualisation (running multiple operating systems or applications simultaneously) and even regulatory policies, yet often users are required to provide information to service providers "in the clear" – means plain-text data without any protection.

Moreover, because cloud-computing software and hardware are anything but bug-free, sensitive information may be exposed to other users, applications and third parties. In fact, cloud data breaches happen every day.

The cyber-security website Csoonline.com compiled a list of 16 of the biggest data breaches of the 21st century all happened during the past 11 years.

At the top of the list is Yahoo. In September 2016 the company announced that it had been the victim of a huge data breach in 2014 – names, e-mail addresses and other data belonging to half a billion users were hacked. The following December Yahoo revised their estimate, and said that 1 billion accounts were hacked in 2013. In addition to names and passwords, users' security questions and answers were also compromised.

In October of 2017, Yahoo yet again revised their estimation of the number of compromised accounts. Instead, it was actually 3 billion.

“Users are required to provide information to service providers without any protection.”

FIGHTING A NEW THREAT MODEL

In a research project that I am leading, we are aiming at providing cloud data security and privacy protection under a new threat model that more accurately reflects the open, heterogeneous and distributed nature of the cloud environment. This model assumes that cloud servers, which store and process users' data, are not to be trusted to keep users' data and the processing results confidential, or even to enforce access limitations correctly. This is a radical departure from the traditional threat model for closed enterprise IT systems, which assume that servers can be trusted.

The central approach of our research is thus to embed protection mechanisms, such as encryption and authentication, into the data itself. In this way, data security and privacy remain even if the cloud itself is compromised, all while enabling authorised to access and process shared data.

PROTECTING THE DATA AND ITS USERS

In our research project, we have created a suite of techniques for scalable access control and computation of encrypted data in the cloud. We also built an attribute-based secure messaging system as a proof-of-concept prototype. The system is designed to provide end-to-end confidentiality for enterprise users, and is built on the assumption that the cloud itself doesn't necessarily keep users' messages confidential.

To understand how it works, imagine that you're depositing valuables in a house to which you have a key and that, from time to time, you want move these valuables to other friends' houses where unknown people may come and go. Each of your friends keeps his or her key, but not all have the same access privileges: their keys can only open certain houses based on the access they have. Such privileges and key sets are managed by a keymaster who stays elsewhere.

“The cloud itself doesn't necessarily keep users' messages confidential.”

“The system has a set of attributes that specifies his or her privileges to receive and decrypt messages.

Every user in the system has a set of attributes that specifies his or her privileges to receive and decrypt messages. For example, Alice's set of attributes could be “student, school of business” while Bob's are “student, school of information systems”. At the user registration stage, the keymaster issues each person a decryption code based his or her attributes.

To send a message securely, a user encrypts it, and the appropriate access policy is attached. The encrypted message is referred to as ciphertext. Only users whose attributes match a message's access policy can receive and decrypt it. For example, if a message is to “all students”, then both Alice and Bob can receive and decrypt it. On the other hand, if another message's access policy is “business-school students”, only those students (meaning Alice but not Bob) can receive and decrypt it.

The system is highly efficient – only one message is generated and delivered regardless of the number of recipients, and it achieves confidentiality even if the cloud-based messaging server and the communication networks are open.

Our system has elicited significant interest, and we're hopeful that it can help people using cloud storage and computing in a more secure manner.

October 20, 2017 

Disclosure statement:

Robert Deng is Professor of Information Systems at Singapore Management University, and the AXA Research Fund has been funding the research that led to this article. The AXA Chair of Cybersecurity aims at providing organisations with the means to protect themselves against cyber criminality while safely enjoying the advantages of cloud storage.





CREDIT CARD FRAUD: WHAT YOU NEED TO KNOW



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**IF YOU ARE THE OWNER OF A CREDIT OR A
DEBIT CARD, THERE IS A NON-NEGLIGIBLE
CHANCE THAT YOU MAY BE SUBJECT TO
FRAUD, LIKE MILLIONS OF OTHER PEOPLE
AROUND THE WORLD.**

Starting in the 1980s, there has been an impressive increase in the use of credit, debit and pre-paid cards internationally. According to an October 2016 Nilson Report, in 2015 more than US\$31 trillion were generated worldwide by these payment systems, up 7.3% from 2014.

In 2015, seven in eight purchases in Europe were made electronically.

Thanks to new online money-transfer systems, such as Paypal, and the spread of e-commerce around the world – including, increasingly, in the developing world - which was slow to adopt online payments – these trends are expected to continue.

Thanks to leading companies such as Flipkart, Snapdeal and Amazon India (which together had 80% of the Indian e-commerce market share in 2015) as well as Alibaba and JingDong (which had upwards of 70% of the Chinese market in 2016), electronic payments are reaching massive new consumer populations.

This is a goldmine for cybercriminals. According to the Nilson Report, worldwide losses from card fraud rose to US\$21 billion in 2015, up from about US\$8 billion in 2010. By 2020, that number is expected to reach US\$31 billion.

Such costs include, among other expenses, the refunds that banks and credit card companies make to defrauded clients (many banks in the West cap consumers' liability at US\$50 as long as the crime is reported within 30 days for credit cards and within two days for debit cards. This incentivises banks to make significant investments in anti-fraud technologies.

Cybercrime costs vendors in other ways too. They are charged with providing customers with a high standard of security. If they are negligent in this duty, credit card companies may charge them the cost of reimbursing a fraud.

“ Worldwide losses from card fraud is expected to reach to US\$31 billion by 2020.

THE TYPES OF FRAUDS

There are many kinds of credit card fraud, and they change so frequently as new technologies enable novel cybercrimes that it's nearly impossible to list them all.

But there are two main categories:

- **card-not-present (CNP) frauds:** This, the most common kind of fraud, occurs when the cardholder's information is stolen and used illegally without the physical presence of the card. This kind of fraud usually occurs online, and may be the result of so-called "phishing" emails sent by fraudsters impersonating credible institutions to steal personal or financial information via a contaminated link.
- **card-present-frauds:** This is less common today, but it's still worth watching out for. It often takes the form of "skimming" – when a dishonest seller swipes a consumer's credit card into a device that stores the information. Once that data is used to make a purchase, the consumer's account is charged.

“Kinds of credit card fraud, change so frequently as new technologies enable novel cybercrimes.”

THE MECHANISM OF A CREDIT CARD TRANSACTION

Credit card fraud is facilitated, in part, because credit card transactions are a simple, two-step process: authorisation and settlement.

At the beginning, those involved in the transaction (customer, card issuer, merchant and merchant's bank) send and receive information to authorise or reject a given purchase. If the purchase is authorised, it is settled by an exchange of money, which usually takes place several days after the authorisation.

Once a purchase had been authorised, there is no going back. That means that all fraud detection measures must be done during in the first step of a transaction.

Here's how it works (in a dramatically simplified fashion).

Once companies such as Visa or Mastercard have licensed their brands to a card issuer – a lender like, say, Barclays Bank – and to the merchant's bank, they fix the terms of the transaction agreement.

Then, the card issuer physically delivers the credit card to the consumer. To make a purchase with it, the cardholder gives his card to the vendor (or, online, manually enters the card information), who forwards data on the consumer and the desired purchase to the merchant's bank.

The bank, in turn, routes the required information to the card issuer for analysis and approval – or rejection. The card issuer's final decision is sent back to both the merchant's bank and the vendor.

Rejection may be issued only in two situations: if the balance on the cardholder's account is insufficient or if, based on the data provided by the merchant's bank, there is suspicion of fraud.

Incorrect suspicions of fraud is inconvenient for the consumer, whose purchase has been denied and whose card may summarily be blocked by the card issuer, and poses a reputational damage to the vendor.

HOW TO COUNTER FRAUDS?

Based on my research, which examines how advanced statistical and probabilistic techniques could better detect fraud, sequential analysis – coupled with new technology – holds the key.

Thanks to the continuous monitoring of cardholder expenditure and information – including the time, amount and geographical coordinates of each purchase – it should be possible to develop a computer model that would calculate the probability that a purchase is fraudulent. If the probability passes a certain threshold, the card issuer would be issued an alarm.

The company could then decide to either block the card directly or undertake further investigation, such as calling the consumer.

The strength of this model, which applies a well-known mathematical theory called optimal stopping theory to fraud detection, is that it aims at either maximising an expected payoff or minimising an expected cost. In other words, all the computations would be aimed at limiting the frequency of false alarms.

My research is still underway. But, in the meantime, to reduce significantly the risk of falling victim to credit card fraud, here are some golden rules.

“To develop a computer model that would calculate the probability that a purchase is fraudulent.”

First, never click on links in emails that ask you to provide personal information, even if the sender appears to be your bank.

Second, before you buy something online from an unknown seller, google the vendor's name to see whether consumer feedback has been mainly positive.

And, finally, when you make online payments, check that the webpage address starts with https://, a communication protocol for secure data transfer, and confirm that the web page does not contain grammatical errors or strange words. That suggests it may be a fake designed solely to steal your financial data.

July 10, 2017 

Disclosure statement:

Bruno Buonaguidi receives funding (post-doctoral fellowship) from the AXA Research Fund.

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I AM NOT THE SUM OF MY PERSONAL DATA



J. PETER BURGESS

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École Normale Supérieure (ENS)*

*AXA Chair “Geopolitics of Risks”,
2015*



**THE CAMBRIDGE ANALYTICA SCANDAL
SCANDALISES EVERYONE... AND AT THE
SAME TIME, NO ONE. SIMILARLY, MARK
ZUCKERBERG'S SOLEMN YET INSOLENT
TESTIMONY BEFORE THE US CONGRESS IS
BOTH REASSURING AND TROUBLING.**

We are oddly complacent and ambivalent, lost in a legal and technical labyrinth that has made this silent theft not only perfectly lawful, but also a consummate example of our new digital reality.

BEYOND OUR OWN GULLIBILITY AND INDIGNATION

First and foremost, there is the problem of cyber interference in our democratic systems. Cambridge Analytica apparently obtained secondhand data collected via a gaping loophole in Facebook's then news feed algorithm. In 2014, when, with naive indignation, users discovered this shortcoming, the company made a unilateral decision to close the loophole.

It appears that Trump's campaign team then asked Cambridge Analytica to tailor highly scientifically targeted publicity campaigns aimed at exponentially increasing support for the candidate during the US presidential election of in 2016.

Beyond our indignation, there is a deeper problem.

The fact that Cambridge Analytica gained access to the personal data of around 87 million Facebook users reflects a far more compelling, although less obvious, reality. We are outraged, incredulous: how could they have been that intrusive without us even noticing?

Has my personal data been stolen? Lost? Misplaced? What, exactly, does this data consist of? In what way is it personal, and how is it really mine? Why does it need to be protected? Is my personal data "mine" in the same way that a bicycle is mine? Can I sell it? And if so, to whom and at what price?

“How could they have been that intrusive without us even noticing?”

A PIECE OF INFORMATION

“57” – This is a piece of data, of digital information. Of course, that number is not mine. It belongs to no-one. Even if I could trace my lineage back directly to the Arabian inventors of our numeric system, I would never attempt to claim this number as my property.

But if I tell you “57” is my age, then you have obtained a piece of personal data. Personal data is an aggregation of various kinds of information, made up on the one hand of a fact and on the other the individual to whom it applies. Personal data is information that can identify me, and me alone, as an individual.

But if the new watchword of our times is “personal data protection”, what exactly is being protected? From what or whom does it need protecting? What is the relationship between “my” personal data and myself?

WILLING AND COMPLICIT IN DATA COLLECTION

What is clear is that protecting an individual’s personal data is not the same thing as protecting the person themselves, at least not in any simple sense. We cannot protect data in the way we would protect an actual object, by taking physical precautions.

In other words: I am not the sum of my personal data. I am not identical to the digital information that is constantly being collected on me and around me, no matter where I am or what I am doing.

Of course, while I am not my personal data, I am increasingly represented by it in what I do, in my work and my leisure time. I am represented by personal data relating to my friends and acquaintances, my university, my employer, the government, security forces, etc.

But what makes this situation even more troubling is that I increasingly present myself through my personal data. Even more curious, I am most often complicit in the systematic collection of my personal data. I seek it out, even desire it.

“While I am not my personal data, I am increasingly represented by it.”

AFFIRMING A MANUFACTURED REPRESENTATION

The moral ecosystem of our social media depends heavily on an unprecedented kind of manufacture and manipulation of the self. Our affirmation of ourselves is dependent on our affirmation of all those around us – the affirmation of a necessarily incomplete, inauthentic, manufactured representation of ourselves, whose inauthenticity is increasingly the vector of our selfhood.

“The most effective way to protect ourselves is to protect our personal data.”

We are heading towards a situation where the most “natural” (and above all most effective) way to protect ourselves is to protect our personal data, which is being collected and processed by automated algorithms, coded by programmers who do not know us, and whom we couldn’t care less about.

When Michel Foucault stated in the final pages of his book, *The Order of Things*, that “as the archaeology of our thought easily shows, man is a recent invention. And one perhaps nearing its end”, he was referring, without being able to precisely name it (he was writing in 1966), to the implicit growing digitization of the human sciences since the “classical era”.

THE DISAPPEARANCE OF THE SELF IN THE DIGITAL ECONOMY

In a country and a continent founded on universal principles, including that of individual sovereignty, we must ask ourselves where the (automated) collection, storage and resale of personal data will lead us.

Strangely, personal data, so vitally important to me and you, is of no interest to online companies like Facebook and Cambridge Analytica. Paradoxically, it is only when I disappear into the digital crowd that my personal data becomes interesting. In other words, it is only when my data is aggregated with that of millions of others that it can generate commercial value.

Data professionals do not care that there was a professor sitting in front of his computer in the Latin Quarter of Paris, aged 57. However, knowing that the average age of residents in the Latin Quarter is 57 – especially if this can be compared to the median age in the other Parisian neighborhoods – is information with added value.

That is the moment when my personal identity recedes, going back to its original enterprise, that of all thinking people: trying to be oneself.

Translated from the French by Alice Heathwood for Fast for Word

April 18, 2018 

“It is only when my data is aggregated with that of millions of others that it can generate commercial value.”

Disclosure statement:

J. Peter Burgess manages the AXA Chair “Geopolitics of risks” at ENS.



WHY PILOTS DON'T ALWAYS HEAR ALARMS



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THE ABILITY TO CONCENTRATE OUR ATTENTION IS ESSENTIAL FOR CARRYING OUT EVERYDAY TASKS. OUR BRAIN HAS BUILT-IN MECHANISMS TO STOP OUR ATTENTION FROM FRAGMENTING AND OUR MINDS FROM WANDERING, AND WHILE THEY MAY BE HIGHLY USEFUL FOR, SAY, WORK, OR DRIVING A CAR, THEY CAN DECEIVE US.

Building up on the work of Mack and Rock at the end of the 1990s, there is now a strong body of evidence that too much focus can make our brains “blind” to very obvious events or stimuli in our environment. Simons and Chabris from Harvard University, brilliantly demonstrated this phenomenon, called “inattention blindness”.

In their experiment, they asked volunteers to watch a video of a basketball training practice and count the number of passes made by players in white t-shirts. More than half of the participants did not see the gorilla that appeared centre screen and beat its chest midway through, so absorbed were they in the task.

BRAIN DEAFNESS

These attentional blinkers are not limited to vision: our auditory system can, astoundingly, be affected to the point of becoming completely deaf. This “inattention deafness” has been highlighted in studies where, for instance, people listening to Strauss’ famous *Also Sprach Zarathustra* failed to notice an unexpected electric guitar solo smack in the middle of the symphonic poem.

Research on our brains’ sudden deafness and the associated cerebral imaging studies have provided vital scientific knowledge for understanding human performance in practical situations, like piloting a plane. The history of aviation is littered with accidents in which human operators in the cockpit did not notice auditory warnings, and persisted in their mistakes.

How could professional pilots ignore such critical information? To answer this question, we must adopt a scientific approach, beyond traditional ergonomic approaches, based on both subjective and objective observations of human behaviour. Recent progress in cognitive neuroscience has indeed revolutionised our understanding of the brain mechanisms underlying our perceptual, cognitive and motor behaviour.

A key factor has been the development of neuroimaging techniques such as fMRI and wearable systems like EEG and fNIRS. But, neuroscience is generally confined to highly controlled laboratory studies, often too removed from the situations we face in our everyday lives.

“Our auditory system can be affected to the point of becoming completely deaf.”

NEUROERGONOMICS

In the last few years, a new discipline has emerged, combining the tools and techniques of neuroscience with the field approach of ergonomics. This discipline, called neuroergonomics, is defined by its founder, Prof. Raja Parasuraman, as the study of the brain at work. This is the approach we adopted in order to understand the mechanisms underlying pilots' deafness to alarms, under the auspices of a chair funded by the AXA Research Fund at the ISAE-SUPAERO aerospace engineering school, in Toulouse, France.

Our initial study was conducted in collaboration with Daniel Callan from NICT at Osaka University, an associate researcher with our laboratory. Pilots were placed in an fMRI and asked to fly an acrobatic plane in a simulator, projected into the scanner through the use of mirrors. Participants were asked to report auditory alarms, set off at regular intervals during the flight scenario.



A simulator hooked up to a near infrared spectroscopic imaging device. Frédéric Dehais, CC BY.

“The brain reconfigures itself to avoid danger.”

The results showed that around 35% of alarms went unheard. Even more interestingly, analyses revealed that certain areas of the prefrontal cortex, the “executive arm” of the brain, were activated when flight conditions became critical, and effectively switched off the auditory cortex, rendering the pilots incapable of processing and responding to the alarms. At the same time, there was increased activity in certain visual areas, associated with processing movement.

It is as if the brain decided that visual information was primordial and smothered the processing of auditory signals. This would likely explain why when driving, for example, we can no longer hear the voices of passengers or the radio during emergency breaking. The brain reconfigures itself to avoid danger and activate the most relevant sense.

While fMRI is a vital tool for identifying which areas of the brain are responsible for this deafness, its temporal resolution is not sufficient to allow us to measure exactly when the phenomenon arises. In order to find this out, we conducted a second experiment with my colleagues Raphaëlle Roy and Sébastien Scannella, using an EEG, a useful technique for studying the brain in action.

‘VISUAL’ PILOTS VS. ‘AUDITORY’ PILOTS

Participants were placed in our simulator, mounted on hydraulic jacks, and confronted with a scenario where smoke was filling the cockpit, meaning they had to make an emergency landing in difficult conditions. Prior to the experiment, the volunteer pilots had to complete a test to determine whether they were more visual or auditory.

According to our results, more than 50% of the alarms were ignored, and “visual” pilots were more likely to fail to respond to alarms than “auditory” pilots. Moreover, analyses of the neurophysiological signals revealed that the mechanism behind deafness to alarms was automatic and intervened very early on, at 100ms post-stimuli – that is, long before the sound reaches consciousness (300ms).

We also developed algorithms to determine whether the pilots were able to hear the alarms, by looking at their neurophysiological responses. In 70% of cases, our algorithm managed to detect when the pilot’s brain was no longer capable of processing the auditory alarms.

A final experiment was conducted in real flight conditions, using light planes from ISAE-SUPAREO, with Prof. Callan. Student pilots wearing EEG headsets were asked to take an instructional flight and manage a number of unexpected situations, while responding to auditory alarms. The use of advanced mathematical tools for signal processing enabled us to further understand the phenomenon of deafness to alarms. When pilots missed the alarms, their auditory cortex was out of phase with the rest of the brain and the environment.

These results add to our initial fMRI study by showing that, in these situations, the auditory cortex likely no longer communicates with the brain. Beyond deepening our understanding of the mechanisms underlying attention, this work also opens up the interesting possibility of integrating sensors into pilots' helmets in order to monitor their attentional states in real time. Ultimately, we should be able to adapt the cockpit and alarms so as to make them more effective for pilots under stress.

Translated from the French by Alice Heathwood for Fast for Word

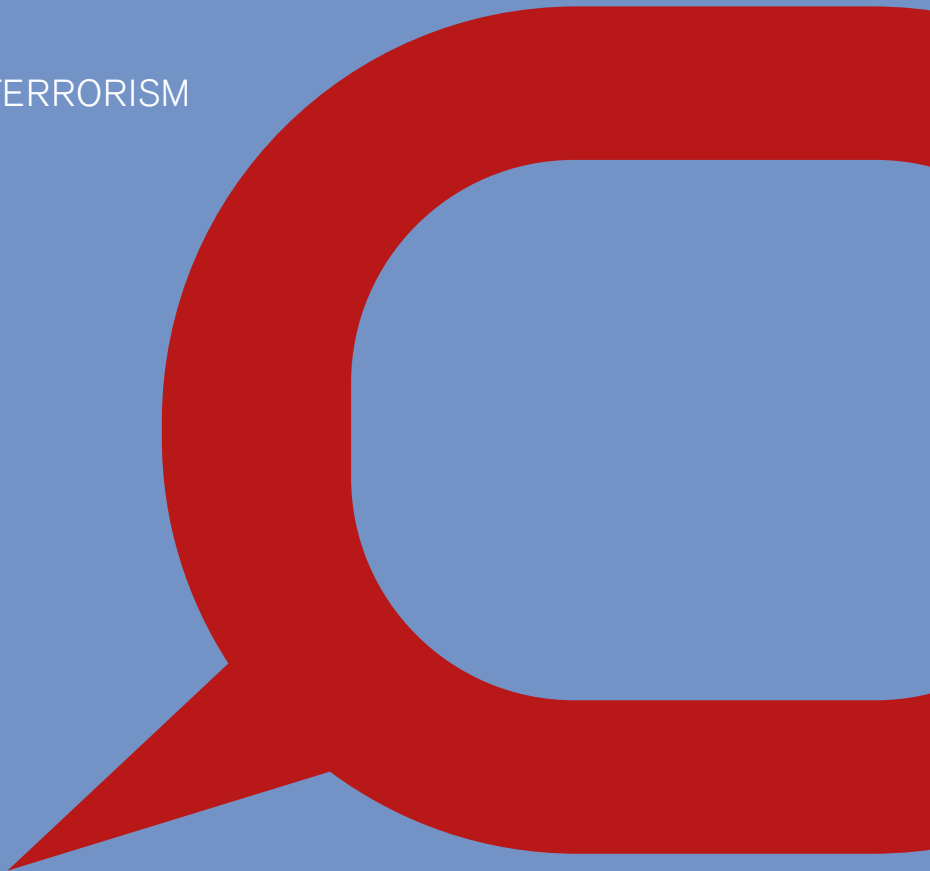
July 26, 2017 

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SOCIO ECONOMICS

- GEOPOLITICS
- FIGHT AGAINST TERRORISM
- ECONOMY





'THE GEOPOLITICS OF RISK': THE NEW AGE OF UNCERTAINTY



J. PETER BURGESS

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AXA Chair "Geopolitics of Risks" 2015



AT A PRESS CONFERENCE AT THE US DEPARTMENT OF DEFENSE, ON THE EVE OF THE INVASION OF IRAQ BY THE ALLIED FORCES IN 2003, DEFENSE SECRETARY DONALD RUMSFELD ADDRESSED A SCEPTICAL MEDIA, UNCONVINCED BY HIS GOVERNMENT'S ARGUMENTS FOR IMMEDIATE INTERVENTION.

Reporters demanded to know what information could possibly justify an act of war against a peaceful sovereign state. Rumsfeld's response went viral: "As we know, there are known knowns; there are things we know we know. We also know there are known unknowns; that is to say, we know there are some things we do not know. But there are also unknown unknowns – the ones we don't know we don't know."

In other words, from a geopolitical perspective, he believed the very uncertainty created by the lack of evidence of weapons of mass destruction justified military action.

PROOF OR POSSIBILITY OF DANGER

We have entered a new age of uncertainty, with a new kind of geopolitical approach to risk. Let us examine this new reality, in which uncertainty – rather than proof and rationality – holds sway over political actions and reactions. In other words, proof of danger has become less important than the possibility of danger. Imagined danger now carries more weight than real danger.

“Proof of danger has become less important than the possibility of danger.”

We are living at a political juncture pervaded by the rhetoric of threat and insecurity. This is clear not only in discourses filled with fear, anxiety and uncertainty, propagating imagined threats, but also in the way our everyday experience of insecurity has changed, and in the sharp increase in security measures implemented by authorities.

These new discourses affect us deeply, even transforming us. They change the way we live our daily lives, our relationships with our loved ones and the way we apprehend others, what is alien, unknown. Threats to our safety are therefore not simple external objects that we can observe with scientific objectivity.

THE END OF A BINARY OUTLOOK

On the contrary. The particularity of risk today is that it concerns us directly. Perceiving, analysing and managing risk is a deeply human enterprise, which raises fundamental questions about who we are and the nature of society.

The notion of security and geopolitical attitudes to it have changed radically since the end of the Cold War. We have switched from a binary perspective (dividing countries into East and West) to a more complex approach, across multiple levels, involving various groups and phenomena: international crime, cyber-attacks, climate change, migratory flows, pandemics, terrorism, and so on.

Questions of security and insecurity are everywhere. It is no longer possible to divide the world in two – us and them, friends and enemies, good and evil, pure and impure, safe and dangerous.

THREATS ALL AROUND US

Computer viruses are already on our hard drives, climate change is already being felt, potential epidemics are already present in the ecosystem and, sadly, terrorists are not beings from a far off, imaginary geopolitical landscape: they are already among us.

The question is no longer “How can we avoid all these threats?”, “How can we keep danger at bay?” or “How can we make the state invulnerable, untouchable?” but “How can we organise ourselves as a society in order to retain our identity in the face of these threats?” And this is not about biology or race, but about values: individual autonomy, respect for others, freedom, equality, tolerance, etc.

At the fundamental level, security is therefore a question of culture, identity, language, democratic institutions, etc. In other words, it has become a societal question, asking us what kind of society we wish to live in.

“How can we organise ourselves as a society in order to retain our identity in the face of these threats?”

EXPERIENCING THE FUTURE NOW

If, as I believe, risk management has now become a social values issue, it is therefore a kind of ethics. But not in the sense of an external, autonomous code of conduct to determine our behaviour or that of others.

Ethics can be seen as the experience of uncertainty, of the unknown, the unexpected or even the unpredictable; as a way of asking what to do when we are uncertain, when we do not have adequate knowledge to know what to do – for it is then that we rely on our values. Values are therefore the primary lynchpin of risk management.

But just like the values we hold dear, risk is not about the present. It is about the future. It is about our behaviour in the face of future danger.

The question is not whether we want to die or suffer from these potential dangers. Of course we don't: we want to live! The question is rather how we want to live, what living in society should mean, what values we should advocate for, which principles should guide us in the most difficult, burdensome times, in times of danger and insecurity?

Translated from the French by Alice Heathwood for Fast for Word

**“Security
has become
a societal
question.”**

June 5, 2017 

Disclosure statement:

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HOW TO ASSESS POLITICAL STABILITY? FOLLOW THE BREAD PATH



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AXA Research Fellow 2016



WHEN EGYPTIANS WERE PROTESTING IN 2011, THEY HELD UP PIECE OF BREAD AND DEMANDED “BREAD, FREEDOM AND SOCIAL JUSTICE”. SINCE THE 2007-8 AND 2010-11 CRISES, RISING PRICES OF FOOD, ESPECIALLY OF STAPLES SUCH AS BREAD, HAVE REPEATEDLY LED ORDINARY PEOPLE TO PROTEST ACROSS THE MIDDLE EAST AND NORTH AFRICA.

“ Understanding bread as an analytical tool.

“ The Moroccan government still controls wheat imports, production and prices.

Bread has also become a symbol of wider demands for affordable and just living conditions, as well as political participation in a region often marked by autocracy and paternalism.

While some governments collapsed, most notably that of Mubarak in Egypt, others have remained in power, like the Moroccan constitutional monarchy. Although Morocco has seen protests, including the “20 February Movement”, which started in Rabat on February 20, 2011, with demands that King Mohamed VI relinquish some of his powers. A constitutional reform later in the year contributed to a relatively stable situation since then.

Political scientists, economists and international media have advanced valuable analyses and identified the main causes of the region’s tumults. Yet the perspectives of ordinary citizens remain surprisingly uncharted. To explore in particular why urban poor Moroccans have not taken to the streets despite economic and political conditions similar to those of their neighbours, it is worth understanding bread not just as a symbol of discontent, but also as an analytical tool.

BREAD AND THE MOROCCAN STATE

As in neighbouring countries, bread has been central to political stability in Morocco for centuries. The monarchy and its political allies, often referred to as the *makhzen* (literally storage or granary), has positioned itself as a provider of food security: its political strength laid in storing cereals to face regular shortages caused by droughts or locusts.

In 1912 the French established a protectorate largely based on the myth of Morocco as the former “Granary of Rome”, and attempted to produce wheat for export to France. After independence in 1956, however, Morocco became an importer of wheat and has remained so ever since.

Morocco’s population has tripled since then, and economic liberalisation promised employment and rising incomes. Nevertheless, youth unemployment and poverty remain high, especially in urban areas, where more than half of Moroccans now live. Despite the rising cost of food, the Moroccan government still controls wheat imports, production and prices. Bread thus remains a politically sensitive staple.

UNDERSTANDING BREAD PRODUCTION

To understand why wheat production, distribution and consumption remain under government control and how this relates to Morocco's relative political stability, I follow bread's path, working backward from its consumption to its production. Thanks to a grant from the Axa Research Fund, this ethnographic research is taking me from the homes of poor Moroccans in the cities of Marrakesh and Beni Mellal, through bakeries and mills as well as urban and rural markets, and into the surrounding fields.

As I trace the trails of wheat grains and their transformation into flour and bread, I observe and participate in sourcing grains, milling them into flour and kneading bread. I also interview consumers, bakers, millers, vendors and farmers to connect cultural practices with broader economic and political processes.

MAKING BREAD, MAKING MOROCCO

All families I worked with so far preferred homemade over commercially made bread. Although women, who are generally responsible for food preparation, are increasingly seeking education and wage work and have more money and less time to cook, they still try to make bread at home whenever possible.

"Homemade bread just has to be there for a Moroccan lunch", I was repeatedly told. This bread is made with water, salt, a rising agent and usually two kinds of flour; one is sourced through rural relatives or from weekly markets in the form of grains and ground into wholemeal flour at home, whereas the other is bought as refined flour and is cheaper, thanks to governmental price controls.

While there are many reasons for using both kinds of flours, the practice of mixing reflects an overall appreciation of homemade food in the face of poverty and urbanisation.

Homemade food is referred to as *beldi* in Moroccan Arabic, which also refers to one's hometown or region. Making bread allows the many recent migrants from the Haouz and the Tadla to hold on to their rural identity and, by doing so, to craft a place to belong in their rapidly growing new home.

“Although women are increasingly seeking education and wage work and have more money and less time to cook, they still try to make bread at home whenever possible.”

At the same time, the government keeps industrially refined flour inexpensive through price caps. Many Moroccans, in particular the recently urbanised poor, mix this lower-quality flour with their preferred homemade flour to make it last longer. This practice allows them to hold on to their culinary and cultural practices and thereby contribute to shaping the Moroccan food system.

BREADMAKING AS AN INDICATOR OF POLITICAL STABILITY

“In making bread Morocco’s recently urbanised poor actively contribute their part to the relative economic and political stability.”

As far as there is evidence, other urban Middle Eastern and North African societies seem to have largely given up making flour and bread at home. A case in point is Cairo, where *balady* bread (the Egyptian word for *beldi*) refers not to homemade but to subsidised, commercially made bread.

Taking the comparison a step further, one might venture to suggest that Egypt’s urban poor no longer contribute to making their staple food and, by extension, enjoyed less cultural, economic and political participation when they took to the streets in 2011.

By contrast, in making bread and thus upholding a central cultural value, Morocco’s recently urbanised poor actively contribute their part to the relative economic and political stability of their country. With global food prices expected to remain volatile in the future, the Moroccan government is thus increasingly put to the task of balancing economic reforms with the need for especially urban food security.

April 12, 2018 

Disclosure statement:

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THE FIGHT AGAINST TERRORISM: THE RULE OF UNCERTAINTY?

ON SEPTEMBER 25, 2017, YET ANOTHER ANTITERRORISM BILL WAS PUT BEFORE THE FRENCH NATIONAL ASSEMBLY. WHILE PROPOSING TO END FRANCE'S CURRENT "STATE OF EMERGENCY", THE BILL WOULD NORMALISE A CERTAIN NUMBER OF EXCEPTIONAL MEASURES, THEREBY UNDERMINING CORE DEMOCRATIC PRINCIPLES.



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TERRORISM, A CHALLENGE FOR DEMOCRATIC SOCIETIES

The apparent increase in terrorist attacks has captured public imagination, placing rising pressure on the political classes. While attacks are more frequent and damaging in African, Middle-Eastern and Asian countries, the power of images, beamed instantly across Western media, renders their violence inescapable.

Regardless of their individual circumstances, all countries impacted by these attacks have implemented their own policies, aimed at combating “terrorism” – increased surveillance and military arsenals, radicalization prevention programs, and the recruitment of undercover agents.

Yet, increased security measures have gleaned ambivalent, or even counterproductive, results. Ironically, authorities’ preferred methods for combating threats to our democratic institutions undermine the very nature of said institutions’ principles and practices. Reinforcing police powers weakens civil liberties and clouds the democratic transparency in public institutions.

As a result, governments are suffering from a kind of democratic identity crisis: how much can we undermine our democratic principles before they lose all meaning? Liberal, democratic principles are put to the test by the policy choices that arise when trying to effectively combat terrorism.

The bill that is being examined by the French lower house aims to “end the state of emergency” that has been in force since the terrorist attacks of November 13, 2015, in Paris and Saint-Denis. However, it fails to take into account an important lesson derived from the political reaction to 9/11 in America: undermining the rule of law, a fundamental notion in our modern democracies, is no guarantee of safety. On the contrary, weakening the institutional and symbolic operation of the rule of law gives rise to new risks, and therefore increased insecurity.

**“ Liberal,
democratic
principles are
put to the test.”**

POLITICS IN THE AGE OF UNCERTAINTY

The “fight against terrorism” is unique in that it requires us to find and conquer something that is unspecified, unidentified and may not even exist. More than anything else, terrorism, by its very nature, thrives on unease, anxiety and fear. The terror arises from an actual attack, but the threat of a future attack, whose form we can only imagine, remains. While an imminent terror attack is a question of fact and reality, its political impact lies in the imagination, in the power of uncertainty, which creates fear.

This is why the shock that descended upon France after the 2015 terrorist attacks helped to justify and even legitimize the creation of a state of exception within French society. If adopted this week as it stands, the bill before the assembly will put an end to it, but it will also integrate its chief measures into standard law. By normalizing this weakening of the rule of law, the bill would constitute a strategic step towards normalizing uncertainty.

Based on the idea that everything is uncertain, the proposed law seeks to arm authorities against the unknown, the unforeseen and the unpredictable. This is a new form of politics, the politics of suspicion, fear, assumption and mistrust.

“The bill would constitute a strategic step towards normalizing uncertainty.”

THREATS TO THE RULE OF LAW

“Integrating measures from the state of emergency into standard law and sacrificing a little “freedom” in the name of “security” destabilises the rule of law, creating insecurity.”

Political theory tells us that the declaration of a state of emergency is a step towards questioning the legitimacy of democracy. Only the Head of State has the authority to declare it. A state of emergency devolves the State into a kind of democratic sub-jurisdiction in which legislative and judicial powers are subject to executive power (typically, only for a given period of time).

This clearly implies the existence of a particular crisis in the wake of which political authorities are temporarily exempt from certain democratic safeguards, normally guaranteed by the rule of law. Let us recall that the rule of law refers to the hierarchical structure of the legal system, and that government bodies must conform to the law when making political decisions in the name of the people. It is what guards the ever-fragile balance between freedom and security in a democratic State.

Integrating measures from the state of emergency into standard law and sacrificing a little “freedom” in the name of “security” destabilises the rule of law, creating insecurity. If, as Aeschylus said, truth is the first casualty of war, the same is true for the state of emergency, only doubly so. The state of emergency also forces governments to break the social contract guaranteeing democratic transparency, yet it is the only political foundation that shields citizens from danger, even in these uncertain times.

RESPONDING TO THE “TERRORIST RISK”

Democratic systems are a form of institutional structure. Traditionally, they are both philosophically and legally bound to protect the safety of citizens. Yet, increasing security measures and reducing their transparency undermines – or, at the very least, threatens – the democratic nature of governments.

Several measures in the bill currently being discussed by French MPs will lead to reduced transparency when it comes to the management of internal security. It is also worth noting that many decisions will rest on the more-or-less arbitrary choices of prefects (France’s state representatives in a given region), given that the text is at times deliberately vague regarding the appropriate grounds for searches, house arrests and even the closure of “places of worship”. Previously, by virtue of the rule of law, judicial authority would have been required beforehand.

With this new bill, the government appears willing to exceed its original mandate by moving towards a system in which they also control contingencies liable to create risk. The real danger then becomes the creation a kind of quixotic society where citizens are mobilized to tilt at windmills.

By targeting anyone and everyone, terrorism aims to damage liberal society (in the philosophical sense), which defines the rights and freedoms intrinsic to community life. By removing the principles and practices of this society in the name of the “fight against terrorism” we run the risk of letting the terrorists win. Let us never forget that democracy – like life itself – is fragile.

Translated from the French by Alice Heathwood for Fast for Word

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WHEN INDIAN WOMEN NEGOTIATE WITH LOCAL AUTHORITIES TO IMPROVE THEIR LIVES IN A SLUM



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HOW DO YOU CONVINCE YOUR LOCAL MUNICIPALITY OFFICER THAT YES, YOU HAVE EVERY RIGHT TO ACCESS CLEAN WATER, WALK ON PAVED STREETS OR HAVE STREETLIGHTS AT NIGHT SO YOU CAN FEEL SAFE? AND HOW DO YOU DO THAT WHEN YOU ARE NOT ONLY LIVING IN AN INDIAN SLUM, BUT YOU'RE ALSO A WOMAN WITH NO FORMAL EDUCATION?

This is exactly the case we studied in Indore, the most populous city of Madhya Pradesh, a western-central state of India. According to the census of India, the population of Indore was 2 million in 2011 and has since increased to 2.8 million inhabitants in 2018. About 30% of that population lives in slums, which are growing rapidly.

INFORMAL HOUSEHOLDS

“There are about 13.7 million slum households in all of India.”

According to the latest census, there are about 13.7 million slum households in all of India, of which 4.9 million are neither recognised nor notified. Considered as informal, such settlements are often deemed illegal by authorities, especially when newly formed. This supposed “illegality” presents challenges to the residents, adding housing instability and fear of displacement to their struggle of finding livelihood while trying to settle down in a new city.

At the same time, several government policies such as the National Urban Health Mission mandate the inclusion of listed and unlisted slums as well as vulnerable populations for services pertaining to living environment such as water supply, sewage, electricity and streets, all of which impact health.

The Indian government does not formally designate any human habitation as “illegal” in policies. However, officials and elected municipal representatives often consider slums de facto “illegal”. At the same time, slum dwellers being recognised as voters with a basti (slum) address on voter cards shows that the illegality can be overcome.

Service provision can be quite slow for many segments of the population and often exclude weaker and vulnerable sections of the society. Consequently, continuous proactive efforts are necessary to “pull” services from the government so that they reach the vulnerable habitations.

AN ATTRACTIVE STRIP OF LAND

The north-eastern peri-urban part of the city of Indore has attracted a population of poor migrants from Rewa and Khargaon districts in Madhya Pradesh and from Uttar Pradesh and Bihar (northern Indian states). Initially about 20 to 30 families moved and developed a settlement in 2014. Previously consisting of a fairly small strip of land and a brick kiln, it served as a site for open defecation and garbage dump for residents of other slums in the vicinity.

It was only when the land was purchased by a real estate broker, who cleared and levelled the site, that this until then unnamed-area started gaining the attention of migrants. The newly emerging settlement presented the possibility of lower-cost housing relative to other slums in Indore and the opportunity to earn livelihood working in nearby factories, construction sites and market places.

Migrants started settling in the area amid unpaved paths, with no electricity or running water. Unpaved streets hampered the movement of residents to and from the settlement and were a hazard for children playing outside. The lack of electricity and water forced residents to travel long distances to fetch water, and left them with no fans in Indore's 40° or 45° Celsius peak heat-waves and no lights in the dark.

“Area amid unpaved paths, with no electricity or running water.”

WOMEN STANDING FOR THEIR RIGHTS

How would the new residents face up to these challenges? Often, civic authorities dismiss their demands by saying “there is no scheme presently” and “there are no orders right now”.

Women of the emerging settlement learned about the activities of our organisation, the Urban Health Resource Centre (UHRC), which mentored and trained women's groups with 12 to 15 members in neighbouring slums to help them access various services.

UHRC social workers visited the new settlement and listened to the challenges of the residents. Through regular meetings and participatory discussions, two groups were formed: Sakhi Saheli Mahila Samooch (Friends and Sisters Women's Group) and Nai Kiran Mahila Samooch (New Light Women's Group) in the end of 2014.

In early 2015 members of these newly formed women's groups discussed with more established groups in the neighbouring *bastis* as to what actions they had undertaken to obtain municipal services. They learned that gentle, perseverant negotiation was the best way forward.

GAINING CONFIDENCE

Through UHRC's training and with the help of women from other, more established groups, residents of the new area acquired knowledge and skills about writing petitions in the local language, Hindi, and submitting them to the ward councillor, the municipal corporation and at the district public hearing. At the top of the list were improvements such as paving streets and running water. When the ward councillor rejected their application, saying their basti was "illegal", the women asserted their rights as citizens and highlighted the value of their votes in elections.

“Women asserted their rights as citizens.”

The women's repeated efforts resulted in the construction of bore-well in one of the areas of neighbourhood and the paving of road in the slum lanes. As of October 2016, 30% of the pathway had been paved. The efforts for the construction of another bore-well and the paving of the remaining pathway are ongoing.

A petition was submitted in December 2016 followed by several in-person representations to the ward councillor in the next six months and several written reminders. In November 2017, when the ward councillor visited the neighbourhood, the residents gently urged him to have the bore-wells installed. As a temporary measure, the community informally accessed water by paying families of the adjacent older slums (who had their private bore-wells) at a monthly rate of INR 100 per family.

INFORMAL SOLIDARITY WORKS

The mentoring role of previously established groups is analogous to the emergence of informal solidarity networks in Greece when the government introduced austerity measures owing to an economic collapse beginning 2009-10.

These informal solidarity networks played a crucial role in helping people overcome difficulties caused by austerity measures and economic instability. The support and guidance of more established community groups helped UHRC learn that the presence of stronger groups has a “ripple” effect on neighbouring settlements. We also learned that soft skills such as tact and a non confrontational approach toward authorities, negotiations through community requests sustained over a long period of time can bring services to informal settlements and help overcome the notion of “illegality” held by officials.

The strategies in place eventually successfully “pulled” services from the municipal corporation and benefited a population of 1,575.

Shabnam Verma, Neeraj Verma, Kanupriya Kothiwala, Shrey Goel are team members and volunteers of the Urban Health Resource Centre. Their work has been funded by the project “AXA Outlook Knowledge and Action Bridge towards risk assessment and resilience building”.

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“ Informal solidarity networks played a crucial role.

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THE DIFFICULT SUBJECT OF REFUGEE ECONOMIES



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MOST WRITINGS ON REFUGEE ECONOMY OR THE IMMIGRANT ECONOMY REFER TO CHANGES IN THE IMMIGRANT LABOUR ABSORPTION POLICIES OF THE WESTERN GOVERNMENTS. THESE WRITINGS REFLECT ON THE ECONOMIC ACTIVITIES OF THE REFUGEES AND OTHER VICTIMS OF FORCED MIGRATION. REFUGEES ARE SEEN AS ECONOMIC ACTORS IN THE MARKET. BUT WE DO NOT GET A FULL PICTURE OF WHY CAPITALISM IN LATE TWENTIETH OR EARLY TWENTY FIRST CENTURY NEEDS THESE REFUGEE OR IMMIGRANT ECONOMIC ACTORS.

**“Do not
dismiss the
refugee as an
economic actor.”**

These writings showcase refugees’ attempts to survive meaningfully in camps, cities, and other settlements, in ethnically homogenous or mixed settings, and the ways they prove useful to market, big business, and organised trade.

Several studies along this line tell us of the success stories of migrants’ economic activities. The message is: the refugee or the migrant as an economic actor has arrived, do not neglect the refugee, do not dismiss the refugee as an economic actor. Yet the organic link between the immigrant as an economic actor and the global capitalist economy seems to escape the analysis in these writings.

BETWEEN ASSISTANCE AND CONTROL OF MIGRANTS

Yet as Michel Agier in his detailed study (*Managing the Undesirables: Refugee Camps and Humanitarian Government*, 2011) of several camps shows, on the ground, however, the structure of care and protection put in place ensures that this remains a situation of permanent catastrophe and endless emergency, where undesirables are kept apart and out of sight, while the care dispensed is designed to control, filter and confine.

How can we explain this duality of care and control coupled with exclusion? Refugee camps are transforming, likewise immigrant settlements are changing. Camps are like holding territories of mobile labour, since they hold at one place an enormous amount of reserve labour. Camps are becoming towns, and other types of big, informal-formal settlements. Without a study of the immigrant as the labouring subject is it possible to make sense of such transformation?

Even on occasions where the refugees or immigrants are considered as economic actors it is a matter of labour market segmentation and differentiation. For instance, Stephen Castles and Mark Miller’s *The Age of Migration* (2003) has an entire chapter on migrants in the labour force.

They take note of the dominant presence of the migrants in the informal economy, “growing fragmentation of immigrant employment and the range and significance of immigrant labour market diversity” (p. 183), and labour market segmentation leading to long term marginalisation of certain immigrant groups and immigrant women workers, and global cities and ethnic entrepreneurs. In all these analyses, market is the conceptual anchor, be it labour market or trade, or marketing of skills.

As a consequence, the question frequently asked is about the impact of the refugees on the host economy, and not, about why economies cannot do without the so-called refugee economies that supply informal labour for the host economy. The further result is that the economic interface of refugees and economies is little understood – also, because sufficient data is not available and the question of refugee impacts does not lend itself to conventional impact evaluation methods. Some suggest comparison of impacts of cash versus in-kind refugee aid.

REFUGEES CONTRIBUTE TO THE HOST COUNTRY'S ECONOMY

But there is nothing special in this. Studies of poverty alleviation programmes in developing countries show specific relevance of both strategies – depending on specific time, locality, and situation. Most studies do suggest however that despite undergoing forced migration and often living in destitute conditions, refugees have productive capacities and assets, and they actively interact with host-country economies.

Governments have realised that labour market integration calls for investment and viewing the arrival of refugees and other forced migrants as opportunities, triggering further growth. Labour market integration helps fiscal sustainability for the host country, given the specific skill base of the migrants say from Syria. Companies therefore call for more efficient refugee policy, so that admitting refugees and other forced migrants becomes a matter of both short-term and long-term investment rather than sunk cost.

“Economic interface of refugees and economies is little understood.

“Refugees have productive capacities and they actively interact with host-country economies.

CAPITALISM FEEDS ON THE INFORMAL ECONOMY AND REFUGEES

“The conventional push and pull theory is simply wrong.

Yet migrant economies create problems for any policy of facilitating labour market integration, because these economies carry the signatures of informal economy, and subsume refugee economies and other labour market actors like climate migrants, illegal immigrants, economic migrants, etc. and are in turn subsumed in the dynamics of informal economy.

The dynamics of the informal economy relating to types of economic activities (for instance in care and entertainment industry in countries of Europe) subsumes all distinctions between refugees and other victims of forced migration, illegal immigrants, environmental migrants, the internally displaced, the trafficked labour, and so on. We have to keep in mind while talking of labour market segmentation the countervailing reality of the utmost flexibility of capitalism to create informal arrangements in production and circulation everywhere.

Michael J. Piore's classic study, *Birds of Passage* (1979) argued that the conventional push and pull theory is simply wrong, and industrial development in one place always creates informal, low paid economy, and calls for the import of informal, low wage labour for jobs that otherwise would not be performed. Indeed, informality and segmentation go hand in hand; between stereotyped and regularised skills and jobs, there is a range of work arrangements creating transitory forms of labour, which navigate several institutional spaces of the market.

“The global now houses the informal within the formal.

The refugee economy is a footloose economy, whose relevance to global capitalism today lies in the salience of the informal mode of production and circulation. The global now houses the informal within the formal. Thus a formal sportswear brand company in its production complex may engage informal makers of shoes, football, cricket bats, caps, etc., who are located across vast distances, or a fashion company may contract tanneries in distant countries of the South for polished leather goods including leather bags.

THE REFUGEE ECONOMY, A GLOBAL ECONOMY

This is possible because standards are global, and the refugee economy in order to survive has to follow the global standards and protocols. The refugee or the immigrant economy in this way becomes a part of the global supply chain of a commodity. Classic is the case of carpet making by Tibetan refugees in Nepal or Syrian refugees making leather and other garment products in Turkey or Bangladeshi immigrants in India engaged in garment making as in Kidderpore in Kolkata. Opportunities and constraints thus have a pattern.

Syrian refugees also present an insightful corpus of experiences of how and when refugees become labouring subjects. All these of course link the management of informal economies on a global scale with the dynamics of global governance. One may argue that global experiences of refugee and migrant economies suggest a broad uniformity of pattern in the formation of the labouring subjects from refugee and immigrant populations, namely that they form a huge dispersed population of footloose labour whose products are linked to global market chains. These population groups must be made to work as per the requirements of the global supply chains of commodities and labour; on the other hand they must remain invisible from the public eye.

“The refugee economy in order to survive has to follow the global standards protocols.”

SKILLED REFUGEES WHO ADAPT

It is now being argued that to resolve the enigma of “refugee economy”, analysts will have to ensure that, wherever possible, all relevant stakeholder groups four in particular – refugees, host population and country, area and country of origin, and providers of assistance (which will include presumably business houses providing marketing opportunities and capital advance to the displaced) – have to be incorporated into the analysis.

Quantitative parameters will then have to be evolved to measure impacts (for example, income, assets, employment and access to natural resources), together with mediating factors such as age, gender and length of exile; also qualitative factors such as perceptions of security and protection will have to be identified. With these two methods,

the goal has to be to construct an overall socio-economic profile and analyse how the profile is affected for each of the stakeholders by forced displacement.

The host country's public-sector fiscal costs and impacts in providing social and welfare assistance for refugees have to be measured, such as, increased medical and education provision, increased demand for utilities such as water, and longer-term capital costs and impacts such as infrastructure investment. And finally, while the methodology's focus will be on livelihoods and micro-economic impacts and costs, assessing the impacts at the macro-economic level will remain an equally important dimension of the analysis. However, all these at the end of the day are labour market analyses. They do not throw much light on the larger forces that lead to absorption or otherwise of refugee and immigrant labour in global economy.

“The eventual absorption of current immigrant flows of skilled, semi-skilled, and unskilled labour in labour markets of Europe and countries of other regions will not be much different from what happened in the pre-Second World War years.

The salience of Syrian and Iraqi refugees and asylum seekers in Europe is that they come from countries occupying the grey zone between the North and the South. With over 80 percent literacy, wide skill base for entrepreneurship, high rate of women's participation in non-family forms of labour, these countries have produced refugees who have deployed knowledge in not only reaching countries where they seek asylum, they also learn quickly new skills, adapt themselves relatively quickly – in a year or two – to new requirements of language, labour protocols, self-run business rules, and learn to straddle the two different but interacting worlds of formal economy and the informal economy.

The eventual absorption of current immigrant flows of skilled, semi-skilled, and unskilled labour in labour markets of Europe and countries of other regions (Brazil, South Africa, Hong Kong, the Gulf countries, etc.), albeit in differential manner, will not be much different from what had happened in Europe, United States, Canada, and Australia in the pre-Second World War years. In this dense labour market scenario pleas for labour market equality receive consideration from well-meaning economists and refugee studies specialists, but formal (political, legal) equality makes sense only if they are relevant for entry in labour markets. Otherwise as labouring subject, the migrant's lack of political equality is the other side of her economic ability to enter the labour market. It is strange then that migration analysts rarely consider the two aspects together, namely lack of entry in the formal

political arena accompanied by entry in the informal and sometimes formal labour market.

ACTIVE, AUTONOMOUS AND NOMADIC MIGRANTS

Immigrant labour's autonomy, more known as "autonomy of migration" allows the migrant to cope with this dichotomous world. For long, it was a case of political opportunity, but economic closure; now it is the case of economic opening (entry in the informal labour market), but political closure; yet the migrant as the footloose labouring subject copes with this upside down world of politics/economics with his/her autonomy to move. In a way this return of economy to the centre stage of discussions on refugees and migrants is strange, but perhaps should not be so, if we recall that at the heart of the "durable solutions" debate in refugee studies circles, the issue of economic rehabilitation was always paramount.

Policy responses concerning labour market form the other side of what has been called the autonomy of migration – a term that means among others the willingness and the capability of the migrants to move on from one condition to another, one job to another, one economic situation to another, and one economy to another. Autonomy of migration means thus heterogeneity of labour forms. This is again brought out by empirical studies, like the one conducted by Alexander Betts and his colleagues. That more than two-thirds of refugees are in protracted displacement, at times in camps and without the right to work or move freely, does not mean that they stay put in one place.

As Betts and his colleagues in their research on African refugees demonstrated, despite the constraints placed on them, vibrant economic systems often thrive below the radar, whether in the formal or informal economy. Refugees are not economically isolated; they are part of complex systems that go beyond their communities and the boundaries of particular settlements. Their report tells us of corn grown in settlements then exported across borders to neighbouring countries, and Congolese jewellery and textiles imported from as far as India and China. Somali shops import tuna from Thailand, via the Middle East and Kenya.

“The case of economic opening, but political closure.”

“Immigration policies produce precarious labour.”

REFUGEES, A NEW RESERVE ARMY OF WORKERS

They are as a result mostly not burden on host states. Migrant labour is relevant to global supply chains of commodities, it is the global nature of the supply chains that produces footloose informal labour and ensures that various categories of the displaced finally add up to the reserve army of labour to be deployed where and when necessary to the extent that big refugee camps look like townships with specific economies linked to various commodity chains. And it is this condition that accounts for the relative autonomy of migration. Therein is the significance of migrant labour, whose marks are irregularity, informality, subjection to unequal labour regimes, degradation of work, footloose nature, subjection to violence, and the fundamental relevance of migrant labour to the logistical aspect of neoliberal capitalism, such as construction labour, work in supply chains, waste processing including e-waste recycling, and last but not least in care and entertainment industry.

In short, immigration policies produce precarious labour. What is important to note in this context, and this has general significance for the task of theorising the migrant as living labour, is that, migrants in the informal labour market are not always particularly dependent on specific employers. Often their fate depends on immigration policies. They reproduce the overall uncertain conditions of the life of labour under capitalism. This calls for a rigorous analysis of the link between the refugee like condition and capitalism, and understand thereby the reasons why refugees and migrants working for low wages are essential for capitalism.

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