

TOWARDS THE SYMBIOTIC ECONOMY: IMAGINING A FUTURE IN 2050

BFN-FUTUREALITIES PRESENTATION TO THE MINISTRY OF LAND, INFRASTRUCTURE, TRANSPORT AND TOURISM (MLIT)

TOKYO, MARCH 2, 2018

Good afternoon, ladies and gentlemen.

It is very kind of you to invite my colleagues and me to share our thoughts on “possibly discontinuous futures”, an interesting phrase. Indeed, we need to try and anticipate disruptive or discontinuous change.

Your focus on spatial planning is very welcome for a geographer like me, who has spent his life trying to anticipate future change for industry and governments.

All futures make assumptions about causes and consequences of change, which are uncertain.

Your vision for a Grand Design makes assumptions about future “compactification” of the metropolitan economy. Allow us to develop a series of themes that may question such assumptions, by highlighting the uncertain outcomes they could produce and suggest how these might lead towards a symbiotic economy.

1. THE STEM RACE OR IP WAR

The development of new technologies is becoming more or less a given, but the way people will live and how they will work and play is highly uncertain.

The long timeframe from scientific discovery to commercialisation means most new technologies can already be anticipated, but their projected application is exaggerated in the short term and understated in the long term.

(Graphene is a good example of such discovery and development.)

However, by 2050 one thing is certain: Japan will be in a global technology race with a host of new metropolitan economies, many of which have yet to recognise the protection of intellectual property (“IP”), patents or other forms of design copyright.

Most of them will have benefitted from those who studied Science, Technology, Engineering and Mathematics (“STEM”) in leading English-speaking universities.

The role of higher education in attracting global talent will be critical to the success of every metropolitan centre, even more so than industry is today.

This highlights the international stimulus to innovation will be a key factor for success. Attracting and keeping that talent means Japanese corporations bringing their best people to Japan. Universities too will need to attract more young foreign talent.

Among your own assumptions is the technology of the wireless realm.

2. THE WIRELESS REALM

Your three-dimensional model highlights the need for what we refer to as a “**wireless realm**”, to describe the infrastructure vital for access to information and knowledge.

The wireless realm, essential for managing spatially distributed activities (like autonomous mobility), could permit the wider dispersal of economic activity.

The requirement for digital wireless broadband to support critical real-time systems **has been neglected** in much of the debate about future mobility and emergency response systems.

Did you notice that today even the Trump administration is considering that it may have to fund a public wireless realm and lease it to operators, because markets are not going to provide the networks as fast as the Chinese are able to do? This opens the way for government revenue capture, to replace gasoline taxes.

It is instructive to ask why.

You recall NTT DoCoMo was once the global wireless communications leader with i-mode and a pioneer of digital mobile telephony. Actually, it dominated system and product design specifications to such an extent that eventually it denied Japanese suppliers global success.

The late adoption of in-vehicle communication by the auto industry, its emphasis on vehicle-to-vehicle safety systems and the reluctance of mobile networks to supply public sector systems, all combined to overlook the need for compatible and failsafe networks in cities.

Just as economists tend to ignore the spatial dimension, we must not assume that your third dimension of a smart future economy will just serve a denser and more accessible version of the present. On the contrary, it will permit **wider dispersal of activity**. (Of course, it will have to ensure access to sufficient network capabilities and network capacity to allow everyone to remain securely connected at all times.)

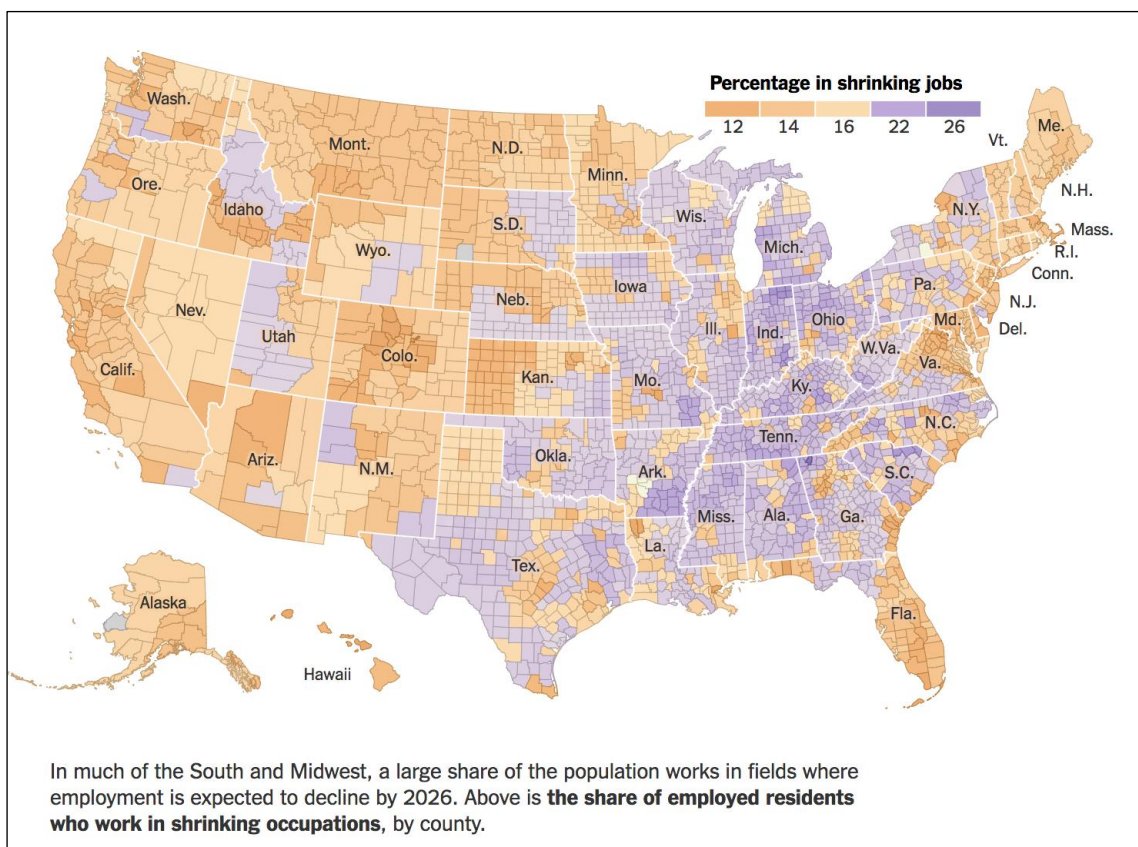
This leads us to consider increasing spatial divergence.

3. INCREASING SPATIAL DIVERGENCE

Before we attempt to guess what economic activities will provide work for young and old, we must recognise that much of what we do today will disappear.

This map is an interesting attempt by the US Department of Labour to demonstrate the vulnerability of US Counties to declining types of employment over the next ten years. Note the anticipated levels of change are huge everywhere: entire **communities are being left behind by economic shifts**.

It is not a forecast but an assessment of the possible impact of change in demand for types of work. (It was done prior to the 2016 presidential election, but maybe Trump had a sneak preview!)



Source: US Bureau of Labor Statistics and Census Bureau, via The New York Times

We must beware of attempting to quantify the future in 2050 and heed the IMF warning below. Data measure past activities, not future ones, so while this map is revealing it does not tell us much about how life might change in 10 years, let alone 30.

**“ We can only measure the *past*,
not the *future*...
...but do we *foresee* only
what we believed
or what we once counted? ”**

Source: IMF Final Report 2010

It is necessary to ask whether the population of Japan will decline to fewer than 100 million by 2050, as your strategy indicates.

It might be worth asking **whether the millennial generation feels that this is the kind of country they want**, where the young have to follow economic activity into greater settlement concentration, where higher cost of living may help explain why they feel so reluctant to have children.

I don't know, but by way of example, in the UK it is certainly the case that those aged 18 to 30 overwhelmingly feel European and do not like being deprived of their EU citizenship by their elders. Their position may even divert the currently predicted course of future events.

This leads us to consider industry assumptions about the future.

4. BEYOND “THE LAST SPOT”: FUTURES FOR INDUSTRIES OF THE PAST?

Regrettably, most **views of the future simply project images of the past**, most often of manufacturing industries, that today account for 12 to 25% of the workforce in advanced economies.

While Japan is still close to 25%, can it avoid the decline in manufacturing employment that affects almost all other countries except Germany?

Why might both countries, Japan and Germany, be the exceptions? Well, Germany has nurtured a form of workforce training and representation more robust than most other countries, that ensures workers can profit from investment in new processes and are not displaced by them.

Your technical training in Japan is definitely among the best in the world, and interestingly is very different to the scientific, research-led education of, say, UK or US universities, which is far more exclusive – although in its way possibly just as innovative.

You lead the world in so-called economic complexity, or what politicians like to call industrial strategy, *Industrie 4.0*, or in one recent case “MAGA – Make America Great Again!”.

Self-sufficiency requires a minimum scale to be able to stay competitive, so in many sectors this leads to extreme concentration: think for example of steel, petrochemicals, nuclear power, etc. It is already clear that in many industries even Japan does not have a sufficiently large market for domestic firms to be globally competitive. (Hence Japanese successes in overseas markets have been key to maintain productive diversity, just as happened for Germany.)

This **extreme concentration is “the last spot”**, what we might call the final “resting place” or grave of great companies. It is the fate of companies that have grown large and successful and come to dominate markets within which, eventually, they can no longer grow and must inevitably decline. Even global companies like Shell constantly seek to avoid it. Those firms that can no longer gain domestic market share are vulnerable to customers’ diversifying their sources of supply from overseas.

One thing is for sure, only new kinds of industries will in the future create work for large numbers of people and not only for robots. So, we need to **think of industry in a different way**.

Industry is not just about making things, but about creating the means to do new things. Perhaps new ways of managing our environment could need just that, we shall see...

But before that, we need to recognise that futures are speculation, not evidence, albeit informed by what we see around the world. We need to question our cultural taboos.

5. CULTURAL TABOOS

Suspend disbelief and allow me to tell you a story about life elsewhere.

There is a weekly tribal battle, fought out at fortresses across a mythical island a long way from here, whose heroes are familiar names...

An island maybe a bit like yours.

The winners and losers of these battles are known even to you here today.

Their gladiators earn fortunes; their assets, revenues and brands are all global. Local sales generate at most 15% of revenues.

Their monarchs are Chinese, Russian, American, Qatari – all places with plenty of big egos.

Today the value of their global brands may be greater than that of any other business on that island...

But each one employs just a thousand people, yet has millions of supporters.

They are, of course, football clubs.

They embody the largely intangible value of the cultural economy. Whether it is a new industry or an old one, an increasing proportion of wealth will be intangible.

This is **competition among cultures for soft power**. This may look like a taboo or a politically incorrect proposition: it is reality.

(I once said so at a conference in Sweden 20 years ago and the Minister of Culture stood up and walked out; so much for Scandinavian tolerance!)

What nations, or even more cities, offer is access to the opportunities their culture sustains. (We are talking here of culture in its broadest sense, including our everyday life experience.) It is what brings people to Tokyo or to other parts of Japan. It is what defines the places we live in, some more to our taste than others.

While openness to other cultures does not threaten one's own, it ensures others can share it, either in reality or in virtual space. But there is a **growing cost of accommodating many millions of tourists**. Without doubt, the demands of these flows will require significant additional infrastructure, and will aggravate environmental risks, such as the risks of increasing water shortage in many tourism hotspots, particularly in vulnerable coastal areas.

To continue our story, we return to our island, which seems to attract people from all over the globe. So, what are the possible futures for the many cultures they find there?

6. METROPOLITAN CONCENTRATIONS: "THE DOUGHNUT ECONOMIES"

These are two possible futures for our mythical fortress economy. There are two doughnuts, one "with the jam in the middle" (blue in the image) and the other "with a hole in the middle" (red in the image).

Both are metropolitan economies in scale and are about 40% the size of Greater Tokyo, at around 15 million people each.

The blue one with the jam in the middle is in many ways like Tokyo... admittedly, we might say, like Tokyo on a bad day.



In these island economies, our mythical island as well as Japan, about 50% of the population is metropolitan and contributes about 70% of GDP, just as they do in California – only a metaphorical island for now!

The future metropolitan economy with a hole in the middle is shown in red. Far fewer overseas people go there, for now.

Metropolitan cities have to be large to be diverse, and their large scale is a function of the markets they serve and what defines them, not of the uniformly same buildings of the office economy!

The “jam” in the middle of our doughnut metropolis is real estate for the service economy.

“Service” has a definition derived from the word “slavery” and describing those who were in service to the wealthy in Victorian times – which clearly do not represent the future of wealth.

Many still do work in circumstances akin to slavery, in roles that are routine, poorly paid and requiring little knowledge, precisely those roles which will be displaced by robots or all kinds.

Today services are the jobs in shops, restaurants, hotels, transport of all kinds, social care, but bizarrely services are said to include also accounting and finance, medicine, IT, communications and so on. It is a meaningless definition.

To answer the question “If not services in the future, then what?”, we need to ask what might generate wealth. It is certainly not in the making, or even in the financing or delivery of things. Making things can generate economic success, but that definitely does not imply a job for all.

Wealth is more than GDP, itself a concept invented in the 1920s to measure economic flows, not assets... or liabilities. We need to recognise that **what makes places attractive to might be a better measure of a community’s wealth.**

In the future metropolis with the hole in the middle, domestic cultural rivalry has replaced industrial competitiveness, but has not yet generated the cultural diversity that draws high-value activities.

The attractive city is how we have expressed this goal, as it has a subtly double meaning: it is both likeable and it succeeds in attracting people to stay there. These are of course related. People don’t like to live in nasty places.

As we said above, **it is cultural diversity that draws high-value activities** to our doughnut with the jam in the middle. Today in that doughnut more people work in financial technology or “fintech” than in finance, and the gap is growing. In the largest centre of global finance, 40% of employment is in fintech.

It is as if Silicon Valley were in the middle of New York, a different culture for sure but just as innovative. The attraction is oddly not only the artificial intelligence (“AI”) community of firms like ARM, but the global financial system. Remember that ARM has only 12,000 employees and never made a thing, but licensed its IP to 99.5% of all smartphones and is now part of the SoftBank group and its Vision Fund based in London.

This points towards a different model for the future economy.

7. THE “POST”-OFFICE ECONOMY

(Of course, this uses the Latin word for “after” and has nothing to do with the postal service!)

Today our doughnut with the jam in the middle is an office economy.

Just like the factory or farm economies before, the office economy is defined by where the work is done and whence it serves its global markets that create its wealth.

But **offices are not what distinguishes that metropolis.**

Its cultural attractions and the hotels and shops that serve them attract more people on a daily basis than the offices. They also attract a global workforce, and are hard to replicate elsewhere.

That metropolis has the largest international real estate market in the world, because it is open to investors, which is a good indicator of the scale of the global marketplace it serves.

It is dominated by what economists call the “service economy” today, but notice how industrial companies struggle to define their activities as a sophisticated mix of systems, services and solutions – heaven forbid, not simple products! Even the automakers are at it.

So services are not simply hotels, shops and offices. Employment in all of these will decline and change, as many roles providing routine financial and trading services will disappear – just as the majority of asset funds are now traded automatically and require fewer investment managers.

Systems do not spare services, or the organisations that occupy offices, they enhance them in space and time.

The office economy will not drive our emerging post-industrial metropolis, the one with the hole in the middle, either.

The barrier to its evolution towards an integrated metropolitan region is in its definition. Our so-called “Peak-Ring” doughnut has a hole in the middle, known as the Peak District, and all its transport arteries link its periphery to the other metropolis.

Where once its transport networks were defined by links to ports for goods and to the capital for government, there were the workers at the heart of a global industrial economy. But this has not been the case any longer for more than 60 years.

Better access among its constituent cities and with global markets might allow it to emerge as a functioning, economically integrated metropolitan region (and incidentally perhaps not so much by faster links to the other metropolis with the jam in the middle!)

But by 2050, will they become globally competitive office economies, or cultural ones? Will real estate investors see them as such – a good measure of success? Almost certainly not.

Neither the office economy nor its post-industrial sister are the future for metropolitan economies.

That lies with the organisations that will take their place. So let us consider the possible fate of those which occupy them today: we have called this the **dissolution of the bureaucracies**.

We have already warned about the fate of companies that reach the last spot.

We are witnesses to an era of extreme concentration in many sectors and with that the death of many formerly independent firms. While many firms today have a very short life, we can also see that many new giant corporations are emerging rapidly across the globe.

In this island today, huge organisations still occupy very large offices and in many they appear to retain strong hierarchical structures and rigid communication channels.

The dissolution of the bureaucracies might be one of the most disruptive changes that could occur in such office economies.

Offices were a product of the need for maintaining control of people and information required to support the increasing scale and globalisation of trade.

The need for people to manage flows of information is disappearing and with it the need for large numbers of office employees and the space they occupy.

More than that, corporations today create immense stress, physical, mental and emotional for their employees. That leads to loss of discipline and security, illness, fear...

Many of the most valuable companies in the world now employ very few people.

Organisations will become more like **confederations of like-minded people** than armies of foot soldiers. Even Uber will not employ those.

WeWork is a company that is just 7-years old but leases more office space in London than any other.

It has very few employees and has a market capitalisation of \$20bn. It accommodates many thousands of people, however.

It is a workspace club, like one we designed ten years ago called "the Engine Room". Please don't ask the obvious question!

The distinction between workspace and meeting space could disappear. Organisations will not be identified by their corporate fortresses, despite the large investments in Googleplex, Apple Park, etc. These could one day become the victims of the digital market subversion.

8. DIGITAL MARKET SUBVERSION

Barriers to people meeting others will be seen as undesirable restrictions on trade within cities. In a digital economy the principal risk is cyber-crime, not burglary! Therefore security will not be built with physical walls any longer.

The digital workstyle is already leading to a shift of work away from dense and expensive metropolitan centres such as Silicon Valley, where traffic congestion and house scarcity mean it is simply too costly to live near enough to work there.

In one key respect we seem to overlook the digitisation of the employment market. In one way this is clear, insofar as the autonomous car may displace the taxi driver. More importantly, everyone in the working population will have **a lifelong digital record of their education, experience and character.**

The biggest barrier to self-employment has always been marketability of the individual. This will be greatly simplified when all available talent will be visible within any given area or field of activity. This will reinforce the way organisations will no longer necessarily retain large numbers of permanent employees. Interestingly, the price of short-term hire may then be higher than for longer-term engagement, the reverse of today.

Nevertheless, the pace of digital AI development has adverse consequences. For a start, training for a lifetime's employment may become an outdated idea.

Also, just as AI technology is undermining trust in Big Tech corporations, their digital network tracking of individuals also undermines privacy, or at least requires a trade-off with employability.

This “**surveillance capitalism**” is also beginning to subvert markets. Prices are no longer a reliable indicator of market equilibrium and in some cases, such as insurance, individual pricing of risk destroys the original principle of mutual risk sharing. The exclusion of the digitally impaired from many markets might further exacerbate the gap between “haves” and “have-nots” in society.

This engenders a **lack of trust in overseeing corporate development of artificial intelligence** that will inhibit its universal diffusion across society.

Corporations are not trusted. Greed trumps corporate social responsibility (“CSR”), a worthless defence of individual rights against executive power and dishonesty.

If so, whom do we trust to ensure that artificial intelligence is not used to harm you or others?

Governments will for sure develop lethal applications of AI. Autonomous weapons are inevitable, even if they are proscribed.

Will governments try to coerce corporations to comply with antitrust laws that inhibit their power, or will they seek to constrain individual rights to freedom of expression?

Authoritarian governments are likely to pressure Big Tech to provide access to individual behaviour-tracking algorithms that will certainly curtail personal freedom.

Such is the mounting concern that it is leading to the loss of trust in governments: perhaps recognition that complexity increasingly exceeds their competence to deal with it.

9. FUTURE LIVES: WHO ARE THEY?

This is a brief and none-too-serious interlude, based on our work – now ten years’ old – for the Kaiteki Institute, seeking to understand who might be the future consumers for the chemical industry.

So perhaps we should ask who will these people be, who lose trust in established organisations. They come in many different guises, of which we defined five: the “disillusioned”, the “invisibles”, the “delinquents” and the “amortals”, not forgetting the young urban metrosexuals or “YUMS”.

Perhaps the **invisibles** will be citizens of nowhere, first of cities rather than countries in any case: a Globish-speaking tribe, exponents of the nether economy, whose wealth resides beyond the reach of governments and tax authorities. (“Globish” is the simplified English spoken internationally as a *lingua franca*. The “nether economy” is made up of all the activities that operate at least partly below the surface of legal scrutiny and control.)

Do the **disillusioned** all think of themselves as the losers? Are these the Trump supporters of today? It has become fashionable to describe the revenge of the populists or even

nationalists, isolated in places beyond the reach of metropolitan life, whose views many despise but can no longer ignore. Their spatial isolation was well shown in our opening map of the USA.

What of the **delinquents**? Those whom society has abandoned in places others don't go to, in mental institutions, or prisons, or old people's homes for the demented and largely forgotten; sadly, we all have too many of them. They represent a global catastrophe, imposing a form of mass segregation on societies.

In contrast, what can we say of the lives of societies' winners? The "YUMS" straddle the disappearing boundary between urban and rural, where they will be offered a choice of both lifestyles in what we have called **rururbia** (from *rus*, countryside and *urbia*, cities). The combination of an apartment in the city and a place in the country is a constant aspiration across cultures.

In our mythical island, most of what we call countryside used to be simply the landed gentry's very large gardens, what we once called their estates in the days of *Downton Abbey* (a popular television period drama portraying the life of the British aristocracy between 1912 and 1926).

Farming, then, is more a way of preserving the appearance of the countryside for those who live and play there.

In our mythical fortress island, the majority of so-called "rural" residents earn their living in either of our two metropolitan centres, because most can travel there within 90 minutes of their homes, in some cases daily, for others once or twice a week.

The question for Japan is whether the rural hinterland is simply an expensive place to farm or a playground, an extension of metropolitan life, not separate from it. Will Japanese millennials want to move out of the cities to enjoy its pleasures by 2050 or before? The transformation of natural and countryside environments into "rururbia" poses many problems, notably of conservation and infrastructure.

But there is one group, the "amortals", whose lives pose a dilemma.

10. THE LONGEVITY DILEMMA: INVESTMENT OR CONSUMPTION?

The biological sciences are at the forefront of developing our understanding of the evolution of human life and its longevity.

It is a given that advances in healthcare technology will deliver more effective ways of preserving good health and curing illness that potentially extend life, but they will do so at a high and rising cost.

The great taboo is to question whether it is acceptable that money buys longevity, because the cost of that longevity is currently increasing segregation and isolation of the elderly in virtual prisons.

It is not a taboo, of course, for the growing population of **amortals** (let's call them the rich, ageing and important), who see their longevity as both a right and an affordable demand for lifelong care. For them, the privileged, it is a gradual decline in splendid isolation.

Should public health systems pander to this vanity and challenge the right to unlimited medical care simply to pay for a longer, but not necessarily better life?

Put bluntly, investing in extending old age might be one of the most wealth-destroying (in purely monetary terms) forms of social investment. Old people consume but do not produce wealth. Indeed their choices may redistribute wealth at the expense of their children.

The demand for longevity is both unsustainable and often undermined by obesity, drink and drugs, the pursuits of choice of the delinquents perhaps (hopefully not in Japan) but of others too.

This one issue has the potential to bankrupt healthcare and/or diminish future growth through substituting consumption for investment in future wealth creation. If a longer old age were not a priority, almost certainly new biotechnologies would be more productively employed in sustaining our niche in the global ecosystem than in increasing our demands upon it.

Nevertheless, increasing longevity raises a critical question. How will the extra years of better health many people will experience (or endure, or enjoy) by 2050 be employed?

We need to recognise that the boundaries distinguishing the three ages of youth, working age and retirement are all moving. Perversely, the young will continue to ape adulthood ever earlier, but achieve independence of family support later and later. The start of working age after further education is in the mid-20s and for some in their 30s, but may not end even at 70. Old age seems set to remain about a 20-year span.

Clearly more years of more people will be needed to care for the young and the old. Possibly as much as 25% of people's working lives may need to be devoted to this role. We cannot all have nannies at both ends of our lives! Perhaps a 25-hour working week will be needed to leave time for family caring.

The opportunities and drawbacks of longevity will determine where we invest our money and what we spend our time doing. It will require investment in a new spatial model.

11. THE PARADOX OF MORE MEANS LESS: HEALTH AND EDUCATION?

It is communities of people sharing ideas that stimulate awareness of innovative ways of doing things that will define future wealth. Ways people express their creativity will embrace everything from craft to culture to conceptual ideas.

But creating communities of inspiring and inspired people is the critical step.

Today some of these communities are called hospitals and universities. Universities are where new knowledge is created at the frontier of discovery, but so too are hospitals, where experts confront unfamiliar sources of risk to human life.

(If you get the chance, do see the BBC-Three “Surgeons at the Edge of Life”, partly filmed at a leading hospital, to recognise that medicine is a constant battle with the unknown of how and when people might die.)

Hospitals and universities are the factories of the knowledge economy today (and in some cases the biggest employers of highly skilled people too – for instance, they employ 20% in my home city, Southampton, you may have heard of only because the captain of its football team is Maya Yoshida!...).

But how much of our investment should go on greater longevity versus on teaching the 50% of young people still to go into tertiary education?

If both “knowledge factories” (universities and hospitals) are approaching the peak of their growth curve in mature markets, will the knowledge economy falter or adapt in new ways? The evolution of “corporate” universities has begun to address the need to make education both relevant and continuing through life. However, the returns on ever-longer time in training for a particular role, such as in the law or finance, are becoming ever shorter, with growing obsolescence of much of what is taught.

Perhaps education will need to concentrate on equipping people to work with an ever expanding range of new possibilities in many fields, rather than satisfying rigid historic performance standards in any single one. All activities will become heavily systems-dependent, especially with artificial intelligence applications.

We call these technology-intensive activities “services” today and assume that they will provide the major source of work for many in the future; but they are also why offices no longer need secretaries or data clerks or other roles already consigned to history. This list will grow to include many in finance, insurance, transport and so forth, of course.

It is the application of “new know-how”, often in systems rather than services, that will generate future wealth. New possibilities will emerge from combining fields of knowledge, such as, in medicine, behavioural tracking and neuroscience to address the fundamental drivers of our physical and mental health and ways of managing them.

They will also begin to challenge our societal norms through scientific understanding of what biological processes, for instance, trigger violence in individuals that society criminalises today, but which will in due course become humanely treatable conditions.

Maybe it will no longer be a taboo to recognise that we are not all born equal in all respects.

12. WEALTH IS MORE THAN THE MAKER MYTH

Your Grand Design paper highlights the role of individual industrial enterprises in many smaller centres.

Forgive me for saying so – we seem to confuse industry with wealth and associate this with factory work for people making things.

Will more people work in factories in today's industries? Almost certainly not, so we need to consider what role future activities might play and for whom.

The factory shopfloor is where fewer and fewer people work in industry, as programmed machines make things whose scale and tolerances are so fine that their assembly defies human intervention.

Work – for those without these maker skills – is not going to be in doing routine things more cheaply, whether in a factory, warehouse or office.

Critical production systems will depend on electronic and, increasingly, biological systems and will function at a microscopic scale, operated by automated systems. These will be extremely flexible in shaping, forming, assembling the physical product. (The much-hyped potential of additive manufacturing, through so-called 3D printers, represents just one possible route to customised or distributed fabrication.)

For those without formal employment, **the so-called gig economy** can be both a safety net, and a step towards a more self-organising economy of smaller businesses.

The key difference, and the critical flaw in the gig economy, is the lack of self-determination of the workers. By way of example, in Holland, individual care workers have each been given a franchise to provide care for a group of patients. Each person works through a standard market platform that links them to the needs of each patient. This replaced the care organisation that previously employed many unskilled carers to provide services that wasted much time and effort. Such **platforms and applications will be the real-time matchmakers**, the work order placed (demand for work) and work performed/service rendered (supply) being matched quickly, for whatever period is needed.

The speed of know-how diffusion is faster today than at any time in the past, particularly if companies invest in their own human capital.

As the means to make things become widely distributed, **scale advantages in production diminish in favour of customisation and speed of response**. Sources of local market supply will replace many global supply chains.

Mass products like Apple's iPhone may be the last examples of global supply chain concentration. Do these also represent the apogee of consumer product innovation? Already in the smartphone ecosystem, apps can be produced anywhere and sold globally for far greater profit.

By 2050 the **physical product may be replaced with a virtual one** that will become the critical link to satisfying smart individuals' intangible desires and needs. This will **diminish the total volume of shipments of both products and materials** through advanced economies.

This is where we come back to our interest in behavioural science. It will be the key to the deployment of intelligent systems in a wide array of situations. It will spell the end of the gig economy too.

13. THE BIOME AND US

The urban biome is just like ours, little understood.

Just as for the patient in the operating theatre, we need to keep the habitat alive with food, water and waste-handling systems that in turn feed our own biome.

We need to think of our environment as a living system, not a dead place like most cities today.

Our biome is the symbiotic link to our physical environment. It explains the speed of adaptation of all animal life, at least.

We are beginning to recognise how **the health of our environment is critical to our own health. It is also the biggest threat to it.**

The urban habitat is just like the trauma patient in hospital, the first candidate for intensive care after a severe case of abuse. How we manage our occupation of the urban habitat has the potential to create skilled environmental care work for many, in their own back yard.

The Swiss pay their farmers to grow fruit trees to preserve the biodiversity of their countryside. But farmers are an endangered minority occupation, and nowhere more so than here in Japan, of course. They may be endangered globally by 2050.

The growth of metropolitan areas is destroying former areas of horticulture that supplied them with fresh food, making them the communities most dependent on long-distance food supply.

We need to recognise that cities are both the generators and destroyers of wealth. Their dependence on long-distance transport for essential supplies of power, water, food and products of all kinds imposes a huge environmental cost on the global economy.

Substituting long-distance food chains with locally adapted sources of supply will be a critical move for replacing damaging monoculture farming that is destroying large areas of land vulnerable to the threat of climatic warming, far from the cities.

Urban growth systems for fresh greens and soft fruit will revolutionise food supply by reducing water demand by up to 99% and eliminating almost all waste, as well as being powered by solar energy.

These will be **the new food factories**, high-tech, both labour-intensive (planting) and with automated routines (feeding, harvesting). Their associated water and waste treatment will enhance local self-sufficiency, not impose demands on distant resources.

This is the future for dematerialisation.

14. DEMATERIALISATION : THE MATERIAL LITE ECONOMIES

To return to our mythical fortress island, dematerialisation has been underway there for all my professional life, from when I used to analyse the steel industry. Those were the glory

days of the doughnut with the hole in the middle. Now it is both a post-industrial economy... and an emerging metropolis, held back by football rivalry and the other doughnut!

It is becoming part of what we call **a material lite economy**, because using energy to transform materials into products is a minor source of added value. Furthermore the source of industrial energy is itself being transformed more rapidly there than in most other energy-rich places.

Just like in other similar economies, its biggest employers are media, medicine and education, all knowledge industries and all part of a high-tech economy; the same as that other “post-industrial” economy in Silicon Valley, it’s just that their contributions are somewhat different today.

The material lite economy uses far less hydrocarbons too, and in this respect our mythical fortress island is something of an exception. From 2025 the majority of power will be generated by lower-cost wind and solar and other renewables with a small nuclear energy base, despite having coal, oil and gas to spare.

Substituting chemistry for combustion is more or less a given. Nonetheless, leadership in distributed energy production and storage systems both fixed and mobile (using batteries and hydrogen fuel-cell sources) will reduce the need for large-scale grid reconstruction and will be critical to providing communities with access to real-time distributed information systems.

And beware the industrial disruption, when a vacuum-cleaner maker – Dyson – plans to launch a solid-state electric vehicle (“EV”) prototype in 2020 from a village with its own engineering university on our mythical island... Just like Tesla, perhaps... but far from Silicon Valley.

While this makes possible a world where “we want to travel more and need to travel less”, electric vehicles may make the urban habitat healthy, but only if there is space for their use.

For sure that we don’t want to commute every day at 6.30am and 7.30pm, but millions will continue to do so around the world, although perhaps less in Japan than elsewhere.

Prospects for the bus are bleak. It is a descendant of the horse-drawn tram, often on the same fixed routes, at inconvenient and uncertain times, etc. You are lucky not to rely on them here so much.

“Random access” or the right to drive on the highway will no longer be feasible. Queueing is just parking on the highway! Indeed, when seen from space, our mythical fortress island looks like an urban parking lot.

The era of random access highways for us to drive on at will, a relic of the horse and cart, is coming to a close, maybe even for cities with the density of transport infrastructure like this one.

For all the talk of autonomous vehicles, there will in practice be very little freedom of movement, in the sense that every trip, by whatever type of vehicle, route, time of day, etc. will be managed from start to end... and not by the passenger.

How you get from A to B at a certain time and speed, alone or with others will be a bespoke solution, at a cost, in those areas lucky enough to have our wireless realm in place.

Mobility will become a market rather like wireless communications. The monthly invoice for the journeys taken will look like a phone bill and may be delivered by those same network operators who manage the wireless realm that is the critical infrastructure for personal mobility.

What will happen then to existing urban infrastructures? How will they adapt?

15. DECONSTRUCTION AND ADAPTIVE INFRASTRUCTURE

Deconstruction is much more than demolition, itself an industry with an image problem!

Yet the Tokyo Garden Terrace Kioicho that stands on the site of its predecessor for the past thirty years, the Grand Prince Hotel Akasaka, is testimony to the possibilities of industrial innovation.

The same is true of former nuclear power stations and oil platforms.

It highlights the problem for all metropolitan cities of how to install new urban fabric in highly dense city environments. In essence, the problem is whether to replace old centralised infrastructure with more of the same or to decentralise utility production and delivery.

The greater the density of urban construction, the greater the load on fixed centralised infrastructures. The quality of yours, here in Japan, is a huge advantage you share with very few other nations today.

Elsewhere transport infrastructure is lacking, or dilapidated; but what type could, or should, be built to support growing populations?

Most cities are thought of as fixed, not transient, environments (unlike here where buildings are depreciated over 30 years and often replaced to serve changing markets).

And for citizens of our mythical fortress island, “their home is their castle”, an enormous impediment to adapting the built environment for the future. (Americans have given this widespread attitude a name – “nimbyism” – that comes from “Not In My Back Yard”.)

But for most of the world that is not the case.

Slums or informal settlements are the motor of urban growth. But their inhabitants are not the factory slaves of China, they are the new dreamers of a future life. Crucially, will they be able to own their property?

16. DREAMERS AND THE URBAN MAGNET: THE “SMART CASUAL” ECONOMIES

In most of the world today, the poor have access to a mobile phone. It provides a glimpse of a future life with access to money, education, media and music for the young and ambitious.

That life is in the metropolises that attract millions of new “dreamers” every year. We call these the “**smart casual**” economies.

Environmental stress and population pressure will drive even more people from rural areas.

These cities have high-rise centres but lack almost all the infrastructure to accommodate their enormous populations and densities.

High-rise accommodation demands high-capacity ground transportation between such areas, but not among the informal settlements that house the majority.

If large-scale demolition and removal of poor people is not socially or politically acceptable (except in Angola or China), giving slum dwellers property rights will ensure that at least they might be paid for the “amount” of land they occupy.

For both major highways and local access, it is equally difficult to fit the necessary conventional centralised infrastructure into the chaos of slum cities: look at Lagos or any number of other vast conurbations.

However, will a **lack of highway infrastructure** inhibit car use, or will such future metropolitan economies be among the first to move towards the managed mobility that autonomous systems promise?

The introduction of mobile banking to provide access to bank accounts for those far from a branch network suggests that the wireless infrastructure might be the system that transforms access in these cities.

In developing autonomous mobility, will Japan be the leader in building such systems in these emerging metropolises?

Highly decentralised population settlements might be more appropriate if innovative water, waste and food production facilities can be built and operated locally.

The good news is that Japan is a leader in factory food-growth systems that will become the market gardens for cities that just happen to be the principal centres of global economic growth for the foreseeable future.

The bad news is that the way metropolitan Japan functions may not be how these new cities will.

Your urban utilities are largely supplied by local, publicly owned organisations, with very little commercial experience of managing the provision of urban infrastructures and utilities elsewhere.

Japan will be able to commercialise its environmental systems abroad only if it becomes partners with such cities. A new role for corporations will not be selling tomatoes or lettuces to Cairo, but equipping the systems in Cairo and elsewhere for them to grow their own.

New model cities will distinguish the emerging metropolitan centres as the future symbiotic economies. The *Kaiteki* society, envisaged by your own Dr Yoshimitsu Kobayashi (Chairman of MCHC and Chairman of *Keizai Doyukai*), is what Society 5.0 (proposed by Mr Hiroaki Nakanishi, Chairman of Hitachi Ltd and new Chairman of *Keidanren*) might look like perhaps.

17. THE FUTURE SYMBIOTIC ECONOMIES

Metropolitan regions around the globe, just like those in Japan, are exhausting water supplies far faster than they can be replaced or expanded, because the distance from these natural resources gets longer and longer every year. (Just check on the fate of Cape Town as it runs out of water right now, but it could be San Francisco or Silicon Valley.)

Worse, urban populations generate huge volumes of wastewater that pollute and render existing surface water undrinkable.

The majority of people in places like Lagos buy small bags of unsafe drinking water at some of the highest prices in the world. In doing so, they also create one of the biggest sources of oceanic plastic waste – much as we do with coffee cups of course, to be fair.

Managing the effective use of water and treatment of waste for human consumption and for food production will transform the economic prospects for those cities and will offer sources of local work in production and distribution.

Future industries are not simply revised versions of those of today, but will create new sources of wealth that provide new kinds of local work and a higher quality of life where people live.

Creating the systems that can manage the human impact on the environment will restore the health of the human habitat and with it the quality of public health. These systems could become the biggest single contributor to future wealth in many emerging metropolitan economies.

The symbiosis of economy and environment, society and science, is the way future wealth could be created.

IMAGINING A FUTURE IN 2050

You may have noticed that for each facet of the future we have briefly described there is both a disruptive possible outcome, as well as a more favourable adaptive change that embraces the new possibilities.

In the following table, one is in green type and the other in red as you can see below; but be assured that has no political significance!

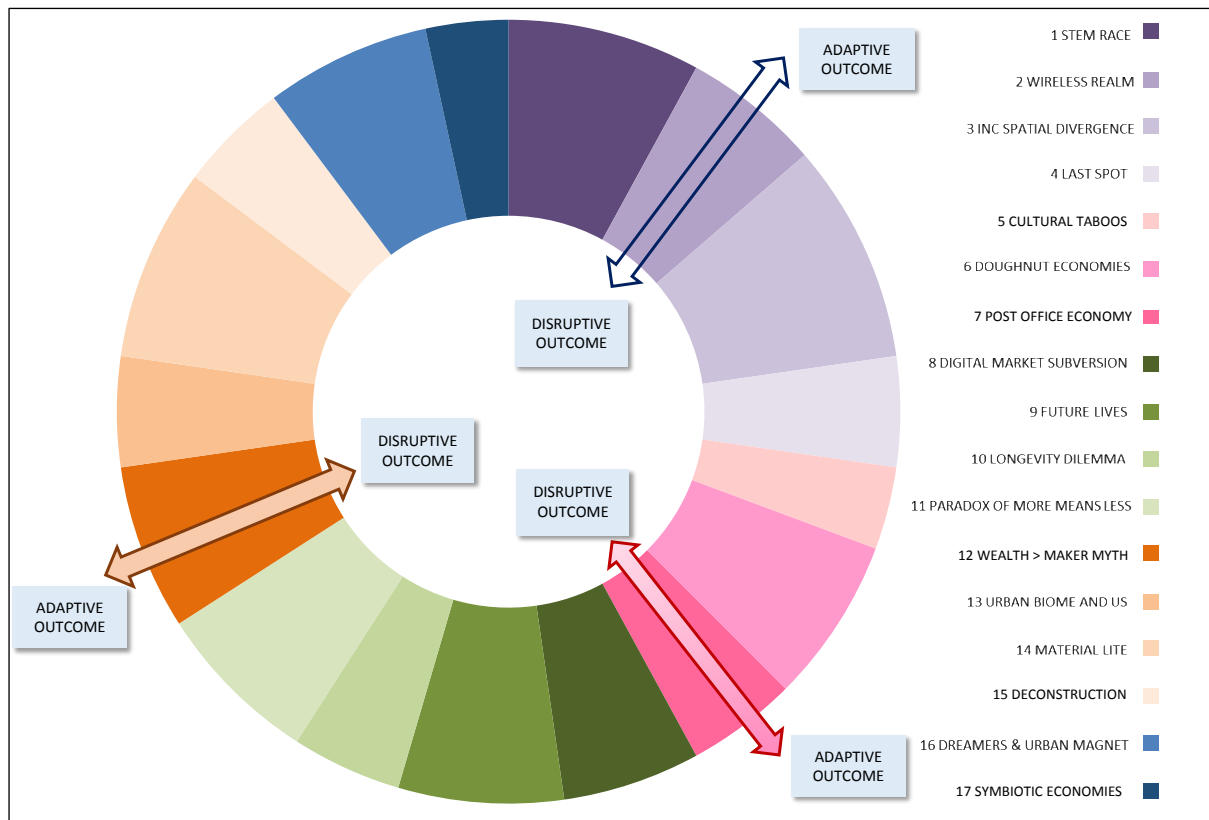
ISSUE	ADAPTIVE OUTCOME	DISRUPTIVE OUTCOME	CHANGE DRIVERS					
			CD1	CD2	CD3	CD4	CD5	CD...
1 STEM RACE	TALENT COMPETITION FOR TECHNOLOGY INNOVATION	LOSS OF IP SECURITY						
2 WIRELESS REALM	WIDER DISPERSAL OF ACTIVITY	GOVERNMENT REVENUE CAPTURE						
3 INCREASING SPATIAL DIVERGENCE	CONCENTRATION OF SETTLEMENT AS YOUNG FOLLOW WORK	COMMUNITIES LEFT BEHIND AS YOUNG FIND NO WORK						
4 LAST SPOT	GLOBAL SOLUTIONS	INCREASED MARKET CONCENTRATION AND MONOPOLY						
5 CULTURAL TABOOS	COMPETITION AMONG CULTURES FOR SOFT POWER	CULTURAL OPENNESS INCREASES SOCIAL RISK						
6 DOUGHNUT ECONOMIES	OFFICE ECONOMIES WITH GLOBAL REAL ESTATE "JAM" IN MIDDLE	DOMESTIC CULTURAL RIVALRY, NOT GLOBAL COMPETITIVENESS						
7 POST OFFICE ECONOMY	ORGANISATIONS AS CONFEDERATIONS OF LIKE-MINDED	DISSOLUTION OF BUREAUCRACIES ENDS PERMANENT EMPLOYMENT						
8 DIGITAL MARKET SUBVERSION	LIFELONG DIGITAL RECORD MARKETS YOUR TALENT EVERYWHERE	DISTRUST OF AI OVERSIGHT OF SURVEILLANCE CAPITALISM						
9 FUTURE LIVES	INVISIBLES, AND YUMS' RURURBIA	DISILLUSIONED / DELINQUENTS AND AMORTALS						
10 LONGEVITY DILEMMA	CARING FOR SOCIAL FAMILIES TAKES A QUARTER OF WORKING TIME	EXTENDING OLD AGE DESTROYS WEALTH						
11 PARADOX OF MORE MEANS LESS	NEW KNOWHOW APPLIED IN NEW SYSTEMS CREATES WEALTH	PEAK EDUCATION AND HEALTH, KNOWLEDGE OBSOLESCENCE						
12 WEALTH > MAKER MYTH	PLATFORMS BECOME REAL-TIME MATCHMAKERS FOR WORK	INDIVIDUAL VIRTUAL NEURAL LINK TO SATSFY INTANGIBLE NEEDS						
13 URBAN BIOME AND US	GROWTH SYSTEM FOOD FACTORIES, LOCAL SELF-SUFFICIENCY	INCREASING GLOBAL DEPENDENCY OF METROPOLITAN REGIONS						
14 MATERIAL LITE	RENEWABLES SUPPORT LOCAL POWER ECONOMIES	LIMIT TO FREE CHOICE OF TRAVEL, MANAGED HIGHWAY ACCESS						
15 DECONSTRUCTION	METROPOLITAN SCALE INCREASES DECENTRALISATION PRESSURE	THE INFRASTRUCTURE RETIREMENT RACE						
16 DREAMERS AND URBAN MAGNET	INFORMAL SETTLEMENTS OF DREAMERS DRIVE ECONOMY	LACK OF INFRASTRUCTURE DRIVES TRANSIENT NETWORK INNOVATION						
17 SYMBIOTIC ECONOMIES	RESOURCE MANAGEMENT SYSTEMS DRIVE WEALTH CREATION	PATHOGEN RISK DRIVES RESTORATION OF HABITAT						

As we said at the beginning there is a tremendous bias in expecting that change will proceed in an orderly adaptive fashion. It doesn't.

Nor does the future comprise seventeen discontinuities, you'll be glad to hear!

So, think of the future as a circle surrounded by all 17 possibilities of change.

(Their outcomes can be disruptive, which are denoted by the inward facing arrows, therefore disturbing the equilibrium, or can be the adaptive ones, which are shown as outward facing arrows, with space to evolve. To the right of the circle is the list of all the 17 issues we have discussed, each coloured differently: they represent our set of future assumptions.)



In the middle of the circle is a future world of seventeen discontinuities or disruptive outcomes!

Now you may ask which combination of outcomes could lead to our symbiotic economy.

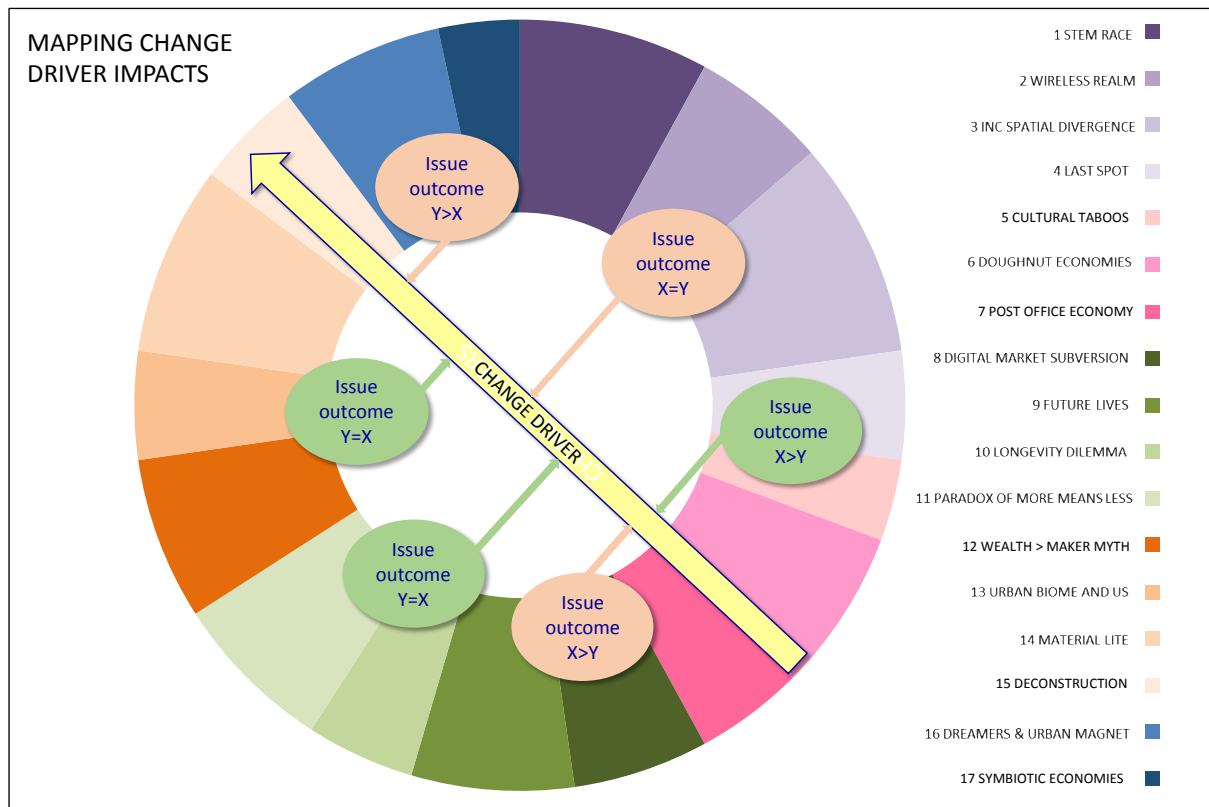
You might also wonder why we have largely ignored many forces for change, climate among them. So **we need to consider the world in the context of such change drivers**. The timing and intensity of these change drivers are uncertain, of course. We need to recognise that these may have different consequences, as circumstances vary.

Our model below identifies these as exogenous change drivers. That means they are independent of the issues and outcomes represented by the circle.

Of course, our table above identifies a series of columns with numbers CD1, CD2, etc. These denote the possible **change drivers**. These will have been identified, over a long series of workshops, both to be of considerable importance and to have the intensity to induce considerable change.

We are interested in what impact they have on the outcome of the issues. In other words whether they might induce change of a disruptive or adaptive nature, or possibly none at all.

We do this by asking our futures groups to judge the impact of each given change driver they have identified, and represent this graphically, as in the following diagram. Choose your favourite change driver and judge its impact (or lack of) on each of the 17 issues.



The diagonal arrow represents the change driver. The small circles represent the disruptive or adaptive outcomes. Each will have a score on both the vertical, adaptive Y axis and horizontally on the disruptive X axis. So our model becomes a map of the impacts of each change driver.

We should then consider **what might induce change** towards either a disruptive or adaptive outcome, but you will be relieved to know that we don't have time here to do so.

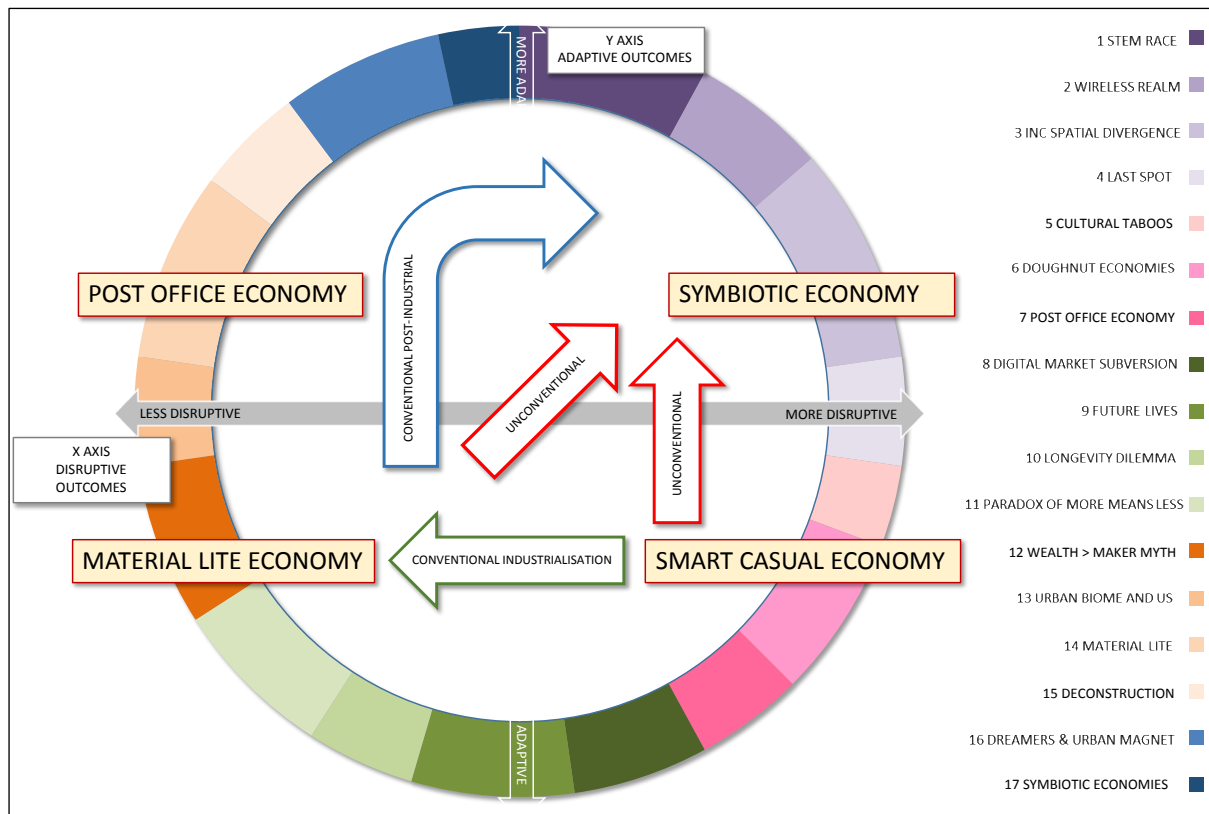
However, we can use this model to distinguish four **possible trajectories for the evolution towards a symbiotic economy**. We have identified four situations that correspond to the conditions we have discussed for metropolitan regions in the 17 issues.

These represent the evolution of four different types of metropolis:

- The post office economy metropolis is in the upper-left quadrant.
- The material lite metropolis is in the lower-left quadrant.
- The smart casual metropolis is in the lower-right quadrant.
- The symbiotic economy metropolis is in the upper-right quadrant.

The first three types are emerging today and we have illustrated the way they may be evolving beyond offices, factories and slums.

So finally, let me show you in what ways a metropolis could transition to the symbiotic economy that we have already begun to describe.



Which is the transition route from one type of metropolis to another? That is the product of change drivers, climate, technology, conflict and a lot besides.

What we can suggest is that the evolution of future metropolitan economies will not necessarily follow the classical industrial development model.

Put simply, the “pre-industrial” metropolitan regions – what we have called here “smart casual societies” – may progress to become proto-symbiotic economies without first developing an industrial or office base. In much the same way, material lite megacities may omit the office economy model to do so as well...

The same unconventional progression may apply to Kansai as much as it may do to our doughnut with a hole in the middle.

It may be more difficult for Tokyo or our other doughnut with the jam in the middle to make the progression towards a symbiotic economy, mainly because it is so complex and resistant to change.

In case you didn't recognise our mythical fortress island, you will see it here more clearly. (It is what a French president once called “a Japanese aircraft carrier off the coast of Europe”.)



But that island is not your main protagonist.

It will be the megacities that will emerge across the dark spaces of the world below.



A beautiful and incredibly accurate representation of economic wealth today...

Yet the three brightest regions in this picture will only account for about 10% of global population by 2050. And maybe only 30% of those, including 60m in Japan, will live in just ten megacity-regions.

It is the other future megacities, which may account for another 20% of world population and more of its GDP, that will be your future markets, not the old world of today.

I hope our story has demonstrated that, despite the distance apart of our islands, our mutual experience suggests that our futures are more similar than many suspect.

But both could depend on futures in places very different from those we know well today.

Thank you for listening.

Now is your turn to disagree.