

10 grand challenges we'll face by 2050

Editing genes, ageing populations, rising sea levels... the world is moving faster than ever. What will those trends mean for our society over the next 30 years?

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13 July 2017

future now

Over the last few months, **BBC Future Now** has been examining some of the biggest problems humankind faces right now: **land use** to accommodate exploding populations, the **future of nuclear energy**, the chasm **between rich and poor** – and much more.

Grand Challenges

In this **special series**, Future Now takes a close look at the biggest, most important issues we face in the 21st Century.

For two months, we'll bring you insight from leading scientists, technologists, entrepreneurs and influencers to help you make sense of the challenges we face in today's rapidly evolving world.

But what about the big challenges that are brewing for the future? In 30 years, what might be on the world's agenda to solve? It's impossible to predict, but we can get clues from how current trends in science and technology may play out. Here are just some of the potential big issues of tomorrow:

1. GENETIC MODIFICATION OF HUMANS

Debates among scientists started roaring last year over a new technology that lets us edit human DNA. It's called Crispr (pronounced 'crisper') and it's a means of altering people's DNA to carve diseases like cancer out of the equation.

Sounds great, right? But what if it takes a dark ethical turn, and it turns into a eugenics-esque vanity project to **churn out 'designer babies'**, selecting embryos that produce babies that will have a certain amount of intelligence or that have certain physical characteristics?

While it's still not widely used enough to be considered a current "grand challenge", this is an up-and-coming advancement whose wide-ranging repercussions we need to be prepared for – and it's all the more reason to **ensure ethicists have a seat at the table** at every laboratory, university and corporation that might be itching to alter our DNA.

"Proper reflection on what about us we might want to preserve takes time – it should draw on a wide range of perspectives about what it means to be human," Nicholas Agar, professor of ethics at the Victoria University of Wellington in New Zealand, **told BBC Future Now** earlier this year. "It's difficult to set aside this time for ethical reflection when new technological possibilities seem to be coming thick and fast."

2. A MORE AGED POPULATION THAN EVER BEFORE

We won't just be wrestling with the fact that the world's population is exploding – but people are living longer than ever, too. Which is great – but all those senior citizens are going to require care. In fact, the number of centenarians will increase more than 50 times – **from 500,000 today to over 26 million by 2100**. From **the UK to Japan to China**, societies with large numbers of people over 65 will become more common. In the next couple of decades, as that increase starts to happen, we'll need better care for the elderly (Japan is even eyeing **robots**) and perhaps policies to allow more immigrants to try and make up for ageing workforces and in some cases, declining birth rates.





Floods and rising sea levels are becoming more common in coastal regions like Florida as populations grapple with the effects of climate change (Credit: Getty Images)

3. LOST CITIES

You don't need to look very hard in **a place like Miami** to see how cities are changing in the 21st Century – rising sea levels are gradually making some of them disappear. Fuelled by climate change, not only are floods becoming more common in the streets, but the changing weather patterns have also influenced building design. Aside from more seawalls, the city is requiring all new buildings be built with their first floor built higher. But that's all a sticking plaster – if current trends continue, we may have to come to terms with losing whole swathes of cities, islands and low-lying regions such as Bangladesh. The economic impact to regions will be profound, and climate refugees could become the norm.

Pressure is already growing on cities, as urban populations grow. If climate change forces mass migration, then existing infrastructure, services and economies may be stretched to breaking point.

4. THE EVOLUTION OF SOCIAL MEDIA

Social media has complicated the way we communicate for the better part of a decade. And it's not going anywhere anytime soon, given that **most people get their news from it now**. That's before we even get into the mess of online harassment, as well. What might social media look like in 30 years, and by that time, what are some threats it might pose?

A world with no privacy, for one. That's one problem we're already seeing. And besides **weathering away our sense of and desire for anonymity and privacy**, social media brings with it the many problems of cyberbullying too. Many charities and non-profit organisations across the world **have mobilised in the fight against internet trolls**, but it's an open question about whether law enforcement agencies and the social media companies can fix it or whether it will get worse.

Then there's also the problem of our information diet to consider: if the status quo of ubiquitous fake news remains, how will that shape how people see the world? If individuals spend months, years, even decades of their life exposed only to unreliable news sources, it does not augur well for civilised society and debate.

That said, given how fast social media has arrived in the world, an optimist may suggest that those problems could soon be resolved. In 30 years' time we may be dealing with social media

issues that we've not even considered yet. After all, Facebook is only 13 years old.

5. NEW GEOPOLITICAL TENSIONS

The past year has seen a complete upset of our geopolitics' fragile balance. That could make the global stability of the next couple of decades a complete question mark.

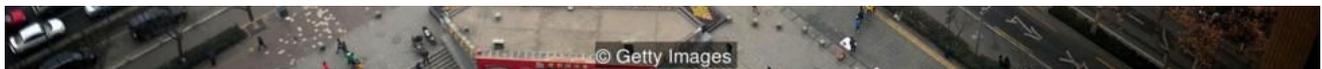
North Korean missile launches. Thousands of refugees crossing borders to flee turmoil. Hackers meddling in other nations' elections. Rising nationalist sentiment worldwide. Headlines in 2016 (and so far, 2017) have been dominated by never-ending political drama that's been fuelling a **'geopolitical minefield'** and an **'unprecedented geopolitical shift'** – whether it's managing unpredictable North Korea, the plight of Syrian refugees, or Britain's transition from the European Union. Throw in widespread hacking, nuclear missiles and other dangerous technology, and it's easy to see why maintaining basic diplomacy becomes vital.

6. SAFE CAR TRAVEL

Despite all the rapid urbanisation and talk of bullet trains and fantastical technology like the **Hyperloop** coming to the fore, the car isn't going anywhere – and in fact, in the next couple decades, there will be even more of them on the road.

Driverless car technology is swiftly rolling out, with major tech companies and automakers aggressively seeking to debut human-free vehicles in coming years. But in addition, the sheer number of cars – self-driving or not – is going to skyrocket, studies show. In **countries like China that are seeing a growing middle class**, the environmental and **infrastructural needs that an increasingly road-faring population** demands is going to be a grand challenge. How do we ensure safety, fight pollution, and make sure driverless cars aren't a menace on the road?





Rapidly industrialising countries like China are seeing equally rapid increases in car ownership (Credit: Getty Images)

7. DWINDLING RESOURCES

The new tech and devices that characterise the 21st Century all require rare earth metals to make – an average smartphone has over 60 “ingredients”. That’s putting **a strain on the planet’s natural resources**: in China, where 90% of the world’s rare earth metals are found, it’s estimated that its mines will run out in the next two decades – and good substitutes for those materials are hard to come by.

8. SETTLING OTHER WORLDS

How will space tourism companies make sure their activities are safe? How will we find ways to send humans to Mars or another planet to live there, as Stephen Hawking **has urged us to figure out**? Space travel might seem like the domain of space agencies and billionaires today, but as it becomes more accessible to everybody else, a whole host of new challenges will emerge. Outer space is increasingly looking less like the final frontier and more like our backyard, and with more money being shelled out to get humans up to the inky abyss than ever before, the logistics, safety and **diplomacy** behind the challenge all demand serious consideration.

9. BOOSTED BRAINPOWER

It’s already common to use drugs to boost brainpower (whether it’s coffee, or **something stronger, like modafinil**), and most of the developed world now relies on their smartphones as an ‘externalised’ memory – but let’s extrapolate that out a few decades. Imagine targeted pharmaceuticals that make us think faster than currently possible, and technological implants that help us concentrate beyond normal human ability for hours or days, for example – these advances are already well underway in laboratories around the world. The question it raises is: what happens to those that cannot afford such enhancements? Could it widen inequality, and allow the rich to get richer? Then there’s also the legal and ethical issues: it’s acceptable to drink a coffee before you sit an exam, but is it ok to use an implant or a smart drug? The challenges posed by intelligence enhancement are only just emerging.

10. AI’S DOMINANCE IN OUR LIVES

Futurist Ray Kurzweil has made a host of predictions – some inspirational, others downright alarming. One of them is the sci-fi-sounding notion that suggests artificial intelligence will one day become more powerful than human intelligence and improve itself at an exponential rate,

otherwise known as **'the singularity'**.

It's far from the majority view, but few would deny that AI is only going to get more powerful. So, like in the case of gene editing, **the tech and AI community** will need to consider the ethical and societal implications of their work as AI comes to shape more realms of our life, from healthcare to financial markets.

As for end-of-the-world extinction scenarios, it's frankly not likely – but that shouldn't obscure the fact that AI is poised to change how we live and work in profound ways. It is also not impossible that specific AIs could malfunction or run out of their creators' control, leading to very human disasters, where lives are lost or millions of dollars are wiped out.

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