

# Captain SUBR:IM in the Year 3000...

## ...A Short Story in Three Parts

*(with apologies to Jasper Fforde)*

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### Part 1

What does climate change mean for Captain SUBR:IM? It's something he sees in the newspaper every day and yet despite international treaties and hefty publications there is still an air of mystery around the subject. Dystopian predictions seem to be just vague enough to ignore. However, life-cycles of robots are rather longer than those of humans and climate change is something Captain SUBR:IM has been thinking about a lot recently.

The biggest problem in climate change is UNCERTAINTY. No-one has exact answers. The Intergovernmental Panel on Climate Change (IPCC) has produced the next best thing – predictions based essentially on educated guesswork, a gigantic database of climate measurements and some incredibly advanced computer wizardry, communicated to decision-makers via 5-yearly reports [e.g. IPCC, 2001]. On a national scale, the UKCIP has produced climate scenarios [UKCIP, 2002] for use in climate impact assessments. The second-biggest problem is that action on climate change is a matter of grasping the political nettle and is low on the policy agenda [DEFRA, 2003].

Debate still rages in the media as to whether it's all a hoax. Given that analysing the finer points of cause and effect are basically worthless when we're huddled in post-apocalyptic bunkers under the Nevada desert, it is now accepted that 'something must be done' about climate change whether the culprit(s) is/are sunspot cycles or ExxonMobil. At one end of the forecasting spectrum is UCLA Professor of Geography, Jared Diamond, who tells of the Polynesian tribe who, a few centuries after migrating to tropical island paradise Easter Island, managed to so decimate their available resources in building a lavish and complex society, that they degenerated into starvation accompanied by gruesome acts of cannibalism [Diamond, 1995] (brownfield sites on Easter Island contain their fair share of human bones, which are fortunately biodegradable). At the other, there is a healthy dose of scepticism which casts such ecological doomsayers into the role of greedy researchers, intent on securing funding for elaborate and unnecessary experiments (most experts fall into the former category... well, they would, wouldn't they?) No wonder there is such hesitancy to commit even to the modest emissions cutbacks demanded by the Kyoto treaty.

Captain SUBR:IM is interested in this debate, but being a practical sort, as well as a world title-holder in the 10m high dive (robot's division (academic)), he is more interested in what he can do about climate change on all the brownfield sites he's looking after. Fortunately, UKCIP is working on an adaptation toolkit to respond to climate change [Willows and Connell, 2003], and Captain SUBR:IM is convinced that this output will be very useful to the brownfield stakeholders.

## Part 2

Faced with the hesitancy of his human colleagues, Captain SUBR:IM decided to do a little preliminary investigation on his own. Jumping into his TimeTravelExpert™ (v8.9), a time travel machine looking something like a sea plane, capable of speeds of up to 950 years/second, he programmed in 12.05pm, 3<sup>rd</sup> July 3000, and was suddenly hurtled through the time-space continuum, with the usual black-outs, bright lights and strange high-pitched whistling noises. He shortly arrived on the banks on the Thames, and the machine gently landed on a desolate shoreline in the shimmering midday heat, by a cavernous river basin, through which oozed a slow, muddy trickle. Waves gently lapped on a pebbly beach, and yet just further up the soil was cracked and fissured, with sparse vegetation. Further still was a small forest, and in a clearing nearby stood some abandoned factory buildings with some suspicious-looking barrels strewn about. A dilapidated circular tent-like structure was visible in the middle distance. No-one was about, possibly because of the heat which registered at 32°C on his internal thermometer. Captain SUBR:IM checked the TimeTravelExpert™'s GPS system to make sure that he hadn't ended up in the Sahara, because it seemed as though there had been a recent dust storm, and he knew that such events were rare in the UK [Boardman et al., 1990]. He was also fairly sure that he wasn't supposed to be anywhere near the sea. Stagnant, anticyclonic air currents wafted towards him from the direction of the factory, making the Captain feel light-headed. He tapped his atmospheric carbon dioxide meter but the needle was off the scale. Remembering his recent (mis)adventures in the tar lagoon [Smith, 2003], he decided against a quick swim, as the water was a strange colour. Instead, he decided to take a walk in the forest, which looked cool and inviting.

Once in the forest, Captain SUBR:IM was intrigued by the many different types of trees, some of which looked familiar and yet... different, somehow. Some of the leaves seemed to be an unusual colour, and although there were a few unhealthy-looking specimens, many of the trees looked surprisingly healthy, in contrast to the sparse grassland. Could it be in this excessive, evidently prolonged heat, the trees were actually using water more efficiently? Did the generous amount of carbon dioxide in the air explain their luxuriant growth? [Broadmeadow, 2002]. But in that case, why had some of the tree species died? And what was causing the colour changes in the leaves, unless it was some GM experiment gone horribly wrong? What exactly was the role of these trees in stabilising and/or mobilising contaminants? [Hutchings, 2002]. Feeling distinctly puzzled, he strolled back to the TimeTravelExpert™, and programmed in 3<sup>rd</sup> December 3000.

It was only a short hop to his next destination – Bolton, Greater Manchester. The only place to land was what looked like a canal, lined with odd-looking buildings on stilts, and groups of willows and poplars in clumps jutting out of the murky water. Visibility was almost zero in the heavy mist and driving sleet. Muttering about the weather always being grim up north, like everything else, Captain SUBR:IM wound down the window and cautiously poked his head out to look around. Quite soon, the sleet began to ease of and the mists slowly cleared. Weak sunlight started to break through the clouds. Putting on his stainless steel wellies, because he saw the water wasn't actually that deep, the Captain jumped down from his seat and waded over to the nearest clump of trees. The landscape was similar in many ways to the one he'd just left, and there happened to be some dilapidated factory buildings nearby. This time, there was definitely something strange about the water sloshing around his ankles. There seemed to be a whole

cocktail of chemicals, both in suspension as particulate solids, dissolved in the water as free ions, and floating on the surface as a free-phase product (all of which he could detect through special devices in his boots). Certainly there was a lot of water, but where had all this contamination come from? Had it leached out of the ground during the drought a mere six months ago, only to be rapidly leached out into surface waters come the intense autumnal rain? Would there have been less contamination had there been less rain? In fact, just how much had rain had fallen, and how much had soaked into the ground? At least now it was clearer how the trees survived in London, if the same sorts of conditions occurred there, although he did wonder how they coped with being regularly flooded.



Seeing black clouds gathering on the horizon again, Captain SUBR:IM decided not to hang about and jumped back in the TimeTravelExpert™, heading for home. On his return journey to 16.05, 5<sup>th</sup> May 2004, Captain SUBR:IM reflected that it was odd that midwinter weather should be so wet, and just cold enough to form sleet, rather than the prolonged crisp winter spell he'd been hoping for.

### Part 3

Technical development of the TimeTravelExpert™ is somewhat behind schedule, and only prototype versions are currently available. Even these clumsy and unreliable machines are marginally outside the project budget for Work Package I. However, we hope to run experiments in the lab using a more accessible technology, called ‘accelerated ageing’. The theory is that the materials being investigated (e.g. soils and cementitious materials, can be aged rapidly in such a way that they would represent the same materials which have aged in real-time normal environment over a very long period of time e.g. decades and centuries. Reactions in the soil, involving contaminant transport, which occur naturally over a long period of time, can also be accelerated by imposing severely adverse lab conditions. For example, durability tests such as cyclic freeze-thaw or wet-dry tests can rapidly simulate the changing seasons of many decades in a matter of days or weeks. These seasonal changes are expected to become more exaggerated (increased fluctuation around zero rather than prolonged cold spells, increasingly frequent/extreme precipitation followed by drought). Both of these mechanisms are known to be particularly harsh and will potentially cause maximum contaminant mobility. One accelerated ageing technique which has been frequently used is elevated temperatures. UV light can also be used. One technique that Captain SUBR:IM is quite excited about is the use of supercritical carbon dioxide.

Hopefully, some of the transport mechanisms only speculated about at present can then be predicted with more certainty, and Captain SUBR:IM can then begin his next big task of working out what to do with all his urban brownfield sites in the coming apocalypse.

## References:

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## Suggested Further Reading:

Fforde, J. (2003). *The Well of Lost Plots*. Hodder, UK. 362pp.