

Computers and ecology

Jörg Becker

MIT computer scientist Nicholas Negroponte enthused in his book Being Digital in 1995 that the digital landscape was giving rise to a new generation which was free of old prejudices and ignored the limitations of geographical proximity as the only basis for friendship, collaboration, games and neighbourliness. He described digital technology as having the potential impact of a natural force that would move people towards greater global harmony.

Microsoft head Bill Gates sounded very much the same in his classic *The Road Ahead*, in which he claimed that the information highway would transport its information and offers beyond the borders of the technically advanced world to the developing countries. He felt this would ultimately bring about an increase in wealth worldwide and have a stabilizing effect, and that the gap between the poor and the rich countries would diminish.

Thirty years before that, the Canadian Marshall McLuhan had carried out media analyses after which he emphatically insisted that, after more than half a century of electricity, man had extended even his central nervous system in a global embrace and thereby eliminated space and time, to the extent that this affects our planet.

Were these statements not written by experienced managers and theorists around 15 years ago, then such eulogies would have to be designated either as the omnipotent fantasies of adolescent males, the language of glossy advertising brochures, or as ideology; ideology in the classical sense of Karl Marx, as a necessarily false consciousness, on the one hand, and on the other, as the controlling knowledge of the political and economic elite, primarily aimed at maintaining and veiling their exploitative class status.

Nothing in these quotations is correct, even purely empirically. On the contrary: during the past 15 years, the world has become more unstable, the gap between poor and rich has widened dramatically, the UN order and national law have had to give way to a Darwinist law of the survival of the fittest in international relations, the climate catastrophe is assuming increasingly threatening proportions (melting glaciers and polar caps, global warming, depletion of the ozone layer), instead of high-tech wars we see a return to mercenary troops, house-to-house fighting and the simplest blood and thunder, and instead of Willy Brandt's plea for "more democracy" in 1969 we have, since 11 September 2001, an increasing dismantling of all the most self-evident civil rights in the wake of a hysterical debate about terrorism and security.

Compared with all this faddish and tendentious chatter about computers, a real debate about computers and ecology involves an analytical return to matter, material, industry, raw materials, production, people's exploitation of finite nature, and people's exploitation of people.

Toxic production

Computers conjure up an image of cleanliness, good value, a product that safeguards materials and the environment. Given that the production of a computer actually requires large amounts of material, this image must necessarily be openly and effectively shattered. According to a UN study, the production of just one workstation computer requires more than 240 kilograms of fossil fuels, such as oil and coal, about 22 kilograms of chemical products and 1,500 litres of water.¹

The ecological assessment of this production is not environmentally friendly, nor are the local conditions of its production. Many of the metals needed to produce a computer are rare (including copper, aluminium, nickel, zinc, gold, platinum, coltan, cobalt), are often only available in 'developing countries', and are cheap to mine in those countries due to exploitative low wages. For example, half of the world's requirement of cobalt comes from just two countries, namely, Zambia and Congo. The people living near the cobalt mines in

Zambia suffer due to polluted soil in which they can no longer grow vegetables, and due to polluted drinking water.

The conditions are even worse when it comes to the threats to health around sites producing computer chips. Chips can only be manufactured in so-called cleanrooms. These are special rooms where particle contamination must be kept below strictly regulated levels and where the highest possible cleanliness regulations apply.

Nevertheless, serious health problems have arisen in chip production over the years because the regulations are not adhered to in the handling of many toxic solutions, or else the instruments and apparatus for their contamination-free handling are lacking. As a result, the risk of cancer, head and muscle pain, breathing difficulties, and infertility is higher, and there is a heightened risk of miscarriage among women.

Often located in tax-free zones, these 'chemical factories' are a core element of what feminists like Christa Wichterich² have often and justifiably described as a typical female 'downside' of the globalisation trend driven and dominated by men: poor peasant women in developing countries labour under inhuman working and living conditions at the lowest possible wage rates in special fenced-in zones, so as to create wealth and comfort for men in the northern countries. This applies in particular to many service industries, such as the software industry and outsourced office work, but also to the textile, shoe, toy, and the chip industries.

Not so long ago, the NGO Greenpeace International examined production locations of chip manufacturers such as Hewlett Packard and suppliers like the US companies Solectron and Fortune in China, Mexico, Thailand and the Philippines. In many cases, Greenpeace was able to ascertain increased contamination of the soil and ground water due to metal residues (lead, nickel, copper), and provide proof of residues of solvents and other poisonous substances.³

It is not only the women working in the chip factories who suffer, therefore, but all the local inhabitants as well, and here in turn the women in particular, given that it is they who carry the social responsibility in traditional societies for the nutrition and health of the whole family.

Exorbitant energy costs

Google – the world's largest advertising agency with a small search engine attached for internet research – is currently building a new server centre in Kronstorf in the federal state of Upper Austria in Austria, which has a population of 3,000. Similar Google data centres already exist in Belgium and in South Carolina, USA. Such a centre comprises huge industrial buildings the size of about ten football pitches, and involves investment costs of an estimated 150 million US dollars per centre.

What is particularly remarkable is the energy consumption of these Google data centres, which are estimated to have the same energy consumption as aluminium plants, known to be very energy-intensive. Just how electricity-guzzling and environmentally-sustainable Google data centres are, can be seen from recent press statements by the Harvard physicist Alexander David Wissner-Gross. To put it simply, two Google searches emit 15 grams of CO₂, i.e. similar to making a cup of tea.

Generally speaking, the different studies of the energy consumption by data centres arrive at devastating results. Estimates by Stanford University reckon that in 2005 the energy consumption of all the data centres worldwide was 20 million megawatt hours, and thus twice as much as five years previously. To put it another way: the consumption was just as high as that of the city of Las Vegas, the world's largest electricity consumer.

The findings of a study by the US American chip manufacturer Advanced Micro Devices (AMD) are just as alarming. According to this study, 14 energy plants in the 1,000 megawatt class work worldwide exclusively to supply electricity to the world's data centres. In Germany alone in 2008, data centres used the incredible overall sum of 10 terawatt hours, which corresponds to the output of four medium-sized coal-fired power plants. The energy requirement of such large computer centres can also be drastically summarised as follows: if it

were not for the use of the internet, Germany could cease operation of two atomic energy plants!

If you add the energy requirement of the mass media to that of the networks and appliances of the computer and information technology industries, then the electricity consumption of these converging industries becomes almost incalculable. If the huge new Panasonic TV screen with a diagonal of 1.65 metres, already requires 720 watts in normal use – corresponding to the energy of 34 very bright energy-saving bulbs – in future the energy requirement for all electronic appliances in private households should increase drastically. A study aptly called *The Ampère strikes back* by the British non-profit organisation Energy Saving Trust⁴ estimates that in the year 2020, 45% of all the electrical energy used in a household will be for such appliances!

And as if all these electricity costs were not enough, the standby costs for televisions, video-recorders, DVD-players, stereo systems etc., are not included in these considerations. Experts estimate these ‘sleeping’ electricity costs for unused appliances in the EU at 4.8 billion euro; this corresponds to an emission of 180 billion tonnes of CO₂ and thus to half of the EU environmental protection target within the framework of the Kyoto Protocol.

Toxic disposal

In October 2008 the magazine *Wissen* in the *Süddeutsche Zeitung*, Germany’s largest daily newspaper, published a shocking report on the disposal of European computer waste in Ghana. Under the heading ‘Im Höllenfeuer der Hightech-Welt’ (In the Hellfire of the Hightech World) it describes the life of African adolescents who live and work on a landfill behind the Agbogbloshie Market in Ghana’s capital city.⁵ This market is Ghana’s largest electronic waste dump. Thousand of people live from this waste, especially children from the age of five. They sort the electronic waste into reusable metals, for which they can earn a wage of 2 Euros per day, which they pay as school fees.

A Greenpeace examination of the soil around this African market came to the following conclusions: the lead content was 100 times higher than the norm at other points in Accra, the concentration of other heavy metals and poisons was about 12 times above the limit, and soil and water were polluted by so-called phthalates, i.e. softeners for plastics like PVC. For the people living on and from the Agbogbloshie market, these poisonous substances lead to headaches, breathing difficulties, infertility, diabetes, cancer, heart, liver, lung and kidney disease, brain swelling and muscular atrophy.

According to estimates by the UN Environmental Programme (UNEP), about 50 million tonnes of poisonous computer waste are produced worldwide each year – 1 million tonnes in Germany alone. And given that the murderous dynamism of a techno-turbo-capitalism leads to an ever faster spiral of ever shorter and new product cycles, the mountain of e-waste is continuously rising, worldwide, every year. Only 25% of the computers and TV screens sold in the EU are also recycled within the EU; the larger portion of 75% ends up as waste in the ‘developing countries’.

Although a special UN Convention from Basel in 1989 prohibited the export of poisonous waste to developing countries, so as ‘to control the transborder transportation and disposal of dangerous waste’, as there is no clear legal distinction between waste and used commodities, American and European exporters legally declare their poison simply as used commodities. What is more, 80% of the world’s computer waste comes from the USA alone, and that country never signed up to the UN convention from Basel ‘for practical reasons’.

As regards the people living on landfills in ‘developing countries’, these mechanisms can be looked at cynically and in the spirit of the British rock group Queen: The show must go on!

To Hell with prophets

Before asking about the political consequences of such structures, it must be made clear that the themes addressed here are only the tip of the iceberg, and that many aspects have not been considered, for example, the scientifically proven health risks from electro-smog when using

UMTS networks (mobile phones).⁶ So what does a critical consideration of the ecological consequences of the information society lead to, and what remains to be done?

First, let us recall in this context the *Divine Comedy* by the great 14th century poet Dante Alighieri. In Canto XX of the first book, he simply sends all prophets to Hell, where they can only move forwards with their heads turned backwards: 'See how he walks with his head twisted backwards, because he thought he saw so far ahead.' In other words: The prognostic chatter of self-appointed prophets like Marshall McLuhan, Nicholas Negroponte, Bill Gates and numerous others must be socially denigrated.

To put it another way: It is an urgent matter of survival to demand an interdisciplinary and anticipative appraisal of the consequences of technology at the point when it is emerging, and to then have that appraisal implemented, practically, politically and legally. Otherwise the mechanisms described here will be perpetuated and speeded up with each new future technology.

The most recent example of this is nano-technology, which is being subsidised with gigantic sums of money, yet whose health risks – the human body's lack of immunity against objects the size of a billionth part of a metre (10^{-9} m) – are only now starting to be taken into account, after about 20 years of uncritical promotion.

Second, the current financial and economic crisis teaches something that any critical mind already knew: the market is destined to fail as a regulatory authority in many conflict situations. Just as the Japanese legislator prohibits inefficient washing machines and the EU Commission certain inefficient light bulbs as of 2009, so numerous computer products must simply be prohibited. It can no longer be accepted that technology companies privatize profits, while the general public has to pay the ecological follow-up costs.

Third, various actions are conceivable which could increase political pressure on companies and governments to finally act. Mention should be made here of the environmental ranking undertaken by Greenpeace, which publishes a list every quarter naming and castigating electronic goods manufacturers based on the quantity of dangerous substances in their products, or else the campaign for fairly-produced computers by the two Swiss development aid Church organisations, Brot für alle and Fastenopfer.

Fourth, journalists specialising in the theme environmental protection – which is not well developed in Germany at all! – should intensify their efforts. A beacon in this context is the Ghanaian journalist Mike Anane, born 1962, president of the Ghanaian League of Environmental Journalists, author of a book about environmental journalism, and unwelcome critic of his own government's lax environmental policy.

Fifth, the theorem of a dematerialised New Economy, indeed of a knowledge society, must be critically questioned. On closer inspection, the so-called New Economy turns out to be a prolongation of the old capitalist economy, with its strong footing in an exploitative handling of material and natural goods, all of which are finite. Once again, the emperor is standing around completely naked!

Finally, a radical, ethically and politically new thinking on all policies is necessary, of the kind already demanded in 1990 by the Catholic theologian Hans Küng in his famous book⁷ *Projekt Weltethos*. At the time, Küng presented five safety rules for future policies:

- Problem-solving rule: a lot of technological progress creates greater problems that it solves.
- Burden-of-proof rule: whoever initiates a technological innovation must prove that it causes no social, cultural or ecological damage.
- Common-welfare rule: the interests of common welfare have priority over individual interests.
- Urgency rule: the more urgent value (the survival of one man or of humanity) has priority over a higher value (the self-fulfilment of one man or a certain group).
- Ecology rule: the ecological system, which may not be destroyed, has priority over the socio-system (survival is more important than a better living).

1. Quoted from: *Computers and the Environment*, ed. by Kuehr, Ruediger and Williams, Eric, Dordrecht and London: Kluwer 2003.
2. Cf. Wichterich, Christa: *Die globalisierte Frau. Berichte aus der Zukunft der Ungleichheit*, Reinbek: Rowohlt 1998.
3. Cf. Brigden, K; Labunska, I.; Santillo, D. and Walters, A.: *Cutting Edge Contamination. A study of environmental pollution during the manufacture of electronic products*, Amsterdam: Greenpeace International 2007 (= <http://www.greenpeace.org/international/press/reports/cutting-edge-contamination-a>).
- 4 <http://www.energysavingtrust.org.uk/Publication-Download>
- 5 Cf. Bitala, Michaela: 'Im Höllenfeuer der Hightech-Welt', in *Süddeutsche Zeitung Wissen*, October 2008, pp. 56-63.
- 6 Cf. Stewart, William: *Mobile Phones and Health. Independent Expert Group on Mobile Phones (IEGMP)*, Oxford: DITCON 2000.
- 7 Küng, Hans: *Projekt Weltethos*, Munich: Piper 1990, pp. 74-75.

Prof. Dr. Jörg Becker (PhD), studied political science, German literature and education at the universities of Marburg, Tübingen and Berne/Switzerland (1966-71), and later on studies in sociology with funds from the Friedrich Ebert-Foundation at City University of New York and Harvard University (1975-76). Since 1987 Professor h.c. in political science at Marburg University and Director of the KomTech-Institute for Communication and Technology Research in Solingen (founded in Frankfurt). Since 1998 Visiting Professor for Political Science at Innsbruck University in Austria. Since 2002 Visiting Professor for Communication Studies at universities in Beirut/Lebanon and Hong Kong.