

# Preface

Natural resources have always been a limiting factor for human development. Once upon a time, it was large animals to hunt, which led to the extinction of large animals tens of thousands of years ago. When farming became more common, the population grew fast until, 1500–500 years ago. New farming methods using fertilizers more systematically developed, and during the 1960s–1970s, there was a new farm revolution, when new species combined with increased use of synthetic fertilizers, fossil fuels, and irrigation gave a doubling of production within a few decades. Along with these resource extensions we also got a strong population growth.

During the 1960s and 1970s, a major concern was that there would not be enough food for the growing population and in parallel the threat that from a large-scale nuclear war could eliminate human life from earth. During the 1990s–2000s, dramatic changes in politics took away the fear for the global nuclear war as the Soviet Union Empire collapsed.

The increase in food production has even reduced the absolute number of poor people by 50% at the same time as population doubled from the 1960s. Especially in East and South Asia, the development of society has been very impressive.

Now we are in a situation where many people aspire to have their own mobile phone, TV, computer, refrigerator, car, etc. This demands huge amounts of materials. Fertilizers demand phosphorous and energy-intensive nitrogen compounds. At the same time, we can see that easy-to-extract oil is starting to run out. It becomes more and more expensive to take up from wells from more remote areas and harsher climates like north of Norway and Canada. All these intricacies put a strong pressure for finding new solutions to sustain a wealthy society, and give those who are still poor good living conditions.

The goal of this book is to identify the available resources and to discuss how these resources can be utilized in a feasible way. We have huge amounts of biomass that could be used more efficiently. Phosphorous is a limiting element, but it could be recycled more efficiently. Different metals could be recycled, but they can be also replaced with more common if technology is developed further, like using FeS, CuO, and similar instead of rare elements in solar cells (PV). Breeding of cattle could be done in different ways to reduce emission of CO<sub>2</sub>, and other crops can be

used as food to decrease the environmental burden. Insects can be used as protein source, as well as soya for direct use for humans.

We hope this book will both give hard facts and inspire the reader to look for new possibilities for future development.

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