

Factor 5

'A Convenient Truth: Increasing Wealth and Reducing Resource Use'

F5 PUBLICATION BRIEF

A publication to update and expand on the groundbreaking book *Factor 4: Doubling Wealth, Halving Resource Use*, to provide a comprehensive primer for improving resource productivity. Factor 5 is an optimistic answer to today's challenges such as global warming, ecosystem decline, water shortage and increasing demands for energy. Factor 5 will serve as a resource for engineers, designers, policy makers, investors, entrepreneurs, business leaders and environmental advocates.



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THE NATURAL EDGE PROJECT AND ERNST VON WEIZSÄCKER

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Over thirty years ago in 1972, the report to the Club of Rome *Limits to Growth* was published, which sent shock waves around the world by arguing that we were rapidly running out of essential resources. Twenty three years later the book *Factor 4: Doubling Wealth and Halving Resource Usage* was also published as a report to the Club of Rome, and offered a comprehensive response to the problems outlined in *Limits to Growth*. *Factor 4*, focused on efficiency in the use of resources, and highlighted that in some cases, this can be done at a profit both in the short and long term, and not at a cost as many were cautioning at the time. The book contained fifty examples of at least quadrupling resource productivity. Twenty examples related to energy, twenty related to materials including water, and ten to transport. As the authors put it, '*the book is about doing more with less*'.



Factor 4, has been an international success, translated into 12 languages (including selling over 70,000 copies in Germany), and remaining on the Earthscan bestsellers list for eight years after publication. However, *Factor 4* was written over twelve years ago. It is high time to undertake an update that addresses in further detail the range of problems that were not seen as so urgent twelve to fifteen years ago, notably global warming, ecosystem decline, water shortage and increasing demands for energy. *The Stern Review*, published in

late 2006, argues that early action will be urgently needed to avoid the horrendous cost from inaction. *Factor 5* will focus on the idea that achieving greater and greater levels of efficiency will be vital to ensuring long term sustainable prosperity for the global economy, especially when coupled with design and process improvements. Stephan Schmidheiny, the founder of the World Business Council for Sustainable Development, said as far back as 1996 that, "*I predict that within a decade it is going to be next to impossible for a business to be competitive without also being 'efficient': adding more value to a good or service while using fewer resources and releasing less pollution.*" Considering this prediction it is heartening to see that a great deal has been achieved to improve the efficiency of businesses already, however there is still much to be done. Fortunately, progress in the development of technology, policies, methodologies and operational frameworks since the publication of *Factor 4* legitimises the call to achieve an even more ambitious target in the next 30 years, namely a factor of five in the increase of resource productivity. And *Factor 5* aims to prove this is achievable.

When focusing on making a transition toward a sustainable future, one must adopt a whole systems approach. The work of leaders such as Amory Lovins and William McDonough show that optimisation of particular parts within a system will not lead to the improved resource productivity required to bring our economy back into balance with our Earth's biosphere. The challenge to achieve a five-fold increase in resource productivity is aimed at stimulating creativity and innovation as we search for new ways of doing things. The challenge is to increase wellbeing and economic growth, while decreasing the use of non-renewable resources and the associated burden on natural resources and ecosystems. It is proposed that this can be achieved by a focus to reduce pollution, first by reducing material flows and then by creating critical knowledge and skill sets to redesign technologies, processes, infrastructure and systems to be both efficient, productive and effective. With this in mind there may be a temptation to search for the light at the end of the tunnel; the 'silver bullet' solution that will solve all future problems.

However, it is becoming more apparent that what we need is more like a 'silver buckshot' approach than a silver bullet; a multi solution approach. And rather than an end goal/light at the end of the tunnel focus we can perhaps think of ***efficiency as our light at the beginning of the tunnel.***

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A focus on improving resource productivity

After over 12 years of efforts to 'double wealth and halve resource use' it is exciting to realise that reductions in resource use through increased efficiency leads time and time again to increased production yields, lower capital and operating costs, and decreased maintenance and repair of infrastructure. A focus on efficiency can create the financials and political and business will to innovate and re-design the overall system with a productivity focus, i.e. taking a *Dual Track Approach*.

The benefits of a focus on improving resource productivity can be enormous, for example:

1. Reducing Greenhouse Gas Emissions: Demand side energy productivity strategies are the most cost effective way to reduce greenhouse gas emissions rapidly. The goal of *Factor 5* is to demonstrate that it is possible to increase energy productivity five-fold; allowing a cut in greenhouse gas emissions by between 60 and 80 percent, while doubling or tripling economic well-being. These improvements can be further enhanced by renewable and sustainable approaches to energy supply. For example a reduction in the demand for energy from a network can reduce the burden on emerging renewable sources struggling to find an economical scale. For example, China experiences acid rain on one third of its territories as a result of the pollution caused by its use of coal fired electricity generation. Through a dual track approach of initially cleaning and sequestering current emissions and then focusing on demand management and renewable generation China and other rapidly industrialising countries can make the shift from the poison of coal fired generation to a long term viable, clean and healthy electricity solution.
2. Pay less for resources: Since achieving sustainability involves a transition and will require investment before returns, it is wise to find the most cost effective way to achieve such a transition. Early strategies focused on efficiency, 'doing more with less', which provides one of the best rates of return of any sustainability investment. Efficiency improvements such as changing light bulbs, improving monitoring and management of water and energy use, and reducing losses in the existing system, are becoming known as a strategy of '*picking the low hanging fruit*'. Based on such a strategy a source of financial resources and capacity building experience can be established, ready to undertake a whole systems approach to productivity improvement and a re-design of the integrated system to capture even greater savings.
3. Increasing business growth and jobs: By their very nature activities within a business that improve resource productivity lead to the opportunity for the same inputs to produce greater outputs. In the case of *Factor 5* the potential is for a five-fold increase in outputs from the same inputs. Hence a company now has a choice, either maintain the current level of outputs by reducing the inputs by five times, or increase the outputs by say three-fold and reduce the input levels accordingly. Adair Turner, former director general of the Confederation of British Industry believes that, '*In the long term, being green pays... action to curtail emissions does not threaten jobs, and failure to act would be a rejection rather than embrace of market economics*'.
4. Outdoing Compliance and Regulations: Advocates of what is becoming know as 'Ecological Tax Reform and Economic Incentives' predict that Government policies will increasingly reflect a shift from an excessive focus on labour productivity towards a strategic increase in resource productivity in the face of growing pollution, resource consumption, and global warming. The rationale for this shift points out that employment (a social good) is currently taxed in a variety of ways, such as payroll taxes and pension contributions by employers (and not government), while environmental pollution (a social bad) receives almost no taxation in all OECD countries, even

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though a focus on its reduction could lead to greater productivity and economic growth. In 1994, DRI and other consultancies commissioned by the European Commission modelled a scenario where all the revenues from pollution taxes were used to reduce employer's non wage labour costs, such as social security payments, superfund payments and payroll tax. The study showed that employment in the United Kingdom would be increased by 2.2 million jobs through such a tax shift.¹

5. Early Adopter Advantage: For many years now literature in the field of sustainable business practice has highlighted the opportunity to achieve a 'First Mover Advantage' and many companies have done just this. Now with the first movers showing promising results, many to be profiled in this new book, the next opportunity is for the early adopters to jump in before the mainstream finally catches on. However this is not a big window of opportunity. For example, looking at the dynamics of Asian economies, it can be assumed that resource productivity will get ever more attention in those countries that have to import most of the natural resources they need. That will mean that resource productivity is bound to become the signature of technological progress in Asia and worldwide. An example of this shift was the meeting of over 100 professors from 40 of China's top business schools in 2002 in Beijing to discuss how they can incorporate environmental content into Chinese graduate management curriculum. This may sound like an academic exercise and not to be paid attention to however China has proven in many cases that once it has chosen a focus it can achieve phenomenal results in a very short period of time. For example, the shift to unleaded fuel took between 10-15 years in most countries however in China, with a massive expanding vehicle fleet achieved this in under 2 years.
6. Speeding up Development: Energy, water and material efficiencies have a cascading effect, reducing significantly the overall environmental load of any engineered system (industrial processes, built environment, products etc.) on the biosphere. Small increases in end-use efficiency can reverse these compounding losses. For instance, saving one unit of output energy can cut the needed fuel input by up to 10 units at the electricity power station, meaning that a factory of super-efficient light bulbs or appliances can replace the need for several power stations. As many developing countries see their economic prospects threatened by rising resource prices, learning to become much more resource efficient can be the best recipe for rapid development.
7. Increasing Security: Energy efficiency, shifting to non carbon based fuels and decentralised energy infrastructure can reduce vulnerability to sabotage and accident and reduce dependence on politically unstable regions of the world. Excessive dependence on imports of natural resources can cause serious security problems that are avoidable if efficiency in the use of resources is drastically increased. In 1982, Amory and Hunter Lovins in the book *Brittle Power*² point out that forty years ago the Defence Electric Power Administration warned that, '*main transmission lines are extremely difficult to protect against sabotage as they are widespread over each state and traverse remote, rugged and unsettled areas for thousands of miles. While these facilities are periodically patrolled, ample time is available for a saboteur to work unobserved.*' Efficiency improvements can also make distributed approaches to energy and water supply much more cost effective.

¹ DRI, *et al* (1994), *Potential Benefits of Integration of Environmental and Economic Policies*, Graham and Trotman and the Office for Publications of the European Communities, Brussels.

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Developing and implementing sustainable solutions

Factor 5 is targeted at the new generation of engineers, entrepreneurs and politicians who are serious about facing the challenges of global warming and other environmental challenges. *Factor 5* maintains the thrust of *Factor 4*, which has been widely regarded as one of the most significant books ever written for engineers and designers on sustainable development. The new title, *Factor 5*, seeks to indicate that it will be a completely new book, involving a new team of authors and contributors led by Ernst von Weizsäcker. As a side line, the authors of *Factor 4* learned that using the number four as a positive indicator actually achieved the opposite in China, where 'four' is phonetically and symbolically associated with death and misfortune. As China may perhaps be the most important country, alongside India and the United States, to adopt strategies to improve the efficiency and productivity of resource use it is important to carefully consider the social implications of language and messaging.

Recently there has been a fundamental shift in public attitude towards sustainability and many are beginning to ask how do we develop and implement sustainable solutions. How can technology be used to reduce or eliminate the negative impacts of our global development? Won't it be too expensive? Providing rigorous examples and strategies towards addressing these questions will be the mission of this publication. As there has been rapid growth in innovation in this area over the last 10 - 15 years it is time to update the text with new case studies, policy mechanisms and engineering innovations so that the book remains an up-to-date resource for decision makers, educators, designers and the broader public.

The new book also has a different emphasis in many regards from the original, *Factor 4*:

- Addressing global warming: The consensus on phenomena and causes of global warming is near complete. The widely held view now is that the next ten to fifteen years could be our last window of opportunity to slow global warming before disastrous run-away processes begin to show their potential for global climate change. Successes in energy efficiency could serve as an encouraging catalyst to further strengthen political action. Leadership is emerging across the world such as the European Union Directives related to waste and pollution, and the EU's plan to curb greenhouse gas emissions by 20 percent by 2020, to the Chinese Eleventh Five-Year Plan Commitments for a 20 percent fall in energy consumption per unit of GDP, to the Governor of California, Arnold Schwarzenegger's aggressive campaign against emissions in California, calling for 60 percent reductions by 2050. This together with the release of Al Gore's film *An Inconvenient Truth* in 2006, the Millennium Ecosystem Assessment, the IPCC Synthesis Reports, and *The Stern Review* have lead to a greater sense of urgency around the world on the need to achieve reductions in greenhouse gas emissions.

European nations such as the UK, Sweden, France, Denmark, and The Netherlands have now made significant reduction commitments of approximately 60 percent by 2050. Far from being a burden, recent studies in the United Kingdom and Australia show that deep cuts in carbon emissions are achievable and affordable. Organisations in the US have also undertaken studies on how to reduce greenhouse emissions significantly over the next 30-50 years,³ while in the UK the

² Lovins, A.B. and Lovins, L.H. (1982) *Brittle Power: Energy Strategy for National Security*, RMI, Colorado. (www.rmi.org)

³ Interlaboratory Working Group (1997) *Scenarios of U.S. Carbon Reductions: Potential Impacts of Energy-Efficient and Low-Carbon Technologies by 2010 and Beyond*, Oak Ridge, TN and Berkeley, CA; Oak Ridge National Laboratory and Lawrence

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Blair Government has released a detailed plan for how a 60 percent reduction in emissions might be achieved. There are now over 13 major studies showing how nations could achieve deep cuts in greenhouse emissions cost-effectively and even profitably.⁴ An update of the original *Factor 4* book, we believe, is essential to help provide a comprehensive overview of the options for 'Prospering in a Carbon Constrained World'.

- Emphasis on Productivity: Efficiency increases are wonderful but remain in the closed box of a distinct function, such as the miles a car can drive with one gallon of gasoline. A broader perspective involving deeper innovations is reached if other modes of mobility or other modes of creating the same added value are taken into consideration as well. This is the more innovative approach for which the term resource productivity is more adequate.

Factor 5 will also explore the link between productivity improvements and economic instruments. Between 1910 and 1960 Labour productivity went in parallel with labour costs, suggesting that the cost of labour may have been a trigger for the increased productivity. As we now face a shortage of natural resources and health ecosystems this new book will investigate the idea that the effective use of economic instruments targeted at increasing the cost of resources can trigger an improvement in resource productivity.

- New instruments to Achieve Productivity Gains. The EU has introduced a system of carbon trading (EU-ETS), supported by a private carbon futures market (ECX), and is underway to adapt it to provide stronger incentives for efficiency gains. Also the idea on a revenue neutral ecological tax reform has found more followers. Capital market instruments can further spur the movements towards higher resource productivity. And even traditional command and control systems see a revival in places like China, where resource efficiency has become one of the top government priorities.
- Exciting New Technologies: Breakthrough advances in solid state lighting, in video conferencing, in remanufacturing and in water saving irrigation methods can be seen as a call for a rapid update for a book featuring efficiency technologies. Concepts complimenting and building on from resource productivity such as Whole Systems Design, Biomimicry (design inspired by nature), and Green Chemistry have entered the scene and need to be addressed.
- Teaching Demand: Technological education around the world is focussing much more systematically on resource efficiency than it did fifteen years ago. It is high time to produce a book on resource productivity lending itself to engineering education. The Natural Edge Project (TNEP) has developed over the last five years a solid understanding and competency in this field and is now partnering with Ernst von Weizsäcker in providing a text that allows students to go into the technical details of examples, in part by links to examples of the underlying mathematical and engineering data.

Berkeley National Laboratory. (ORNL-444 and LBNL-40533, September); Mintzer, I., Leonard, J.A. and Schwartz, P. (2003) *US Energy Scenarios for the 21st Century*, Pew Center on Global Climate Change.

⁴ References to reports that show that deep cuts in greenhouse emissions are possible: Turton, H., Ma, J., Saddler, H. and Hamilton, C. (2002) *Long-Term Greenhouse Gas Scenarios*, Discussion Paper No. 48, The Australia Institute, Canberra; Department of Trade and Industry (2003) *Our Energy Future – Creating a Low Carbon Economy*, Energy White Paper, UK Department of Trade and Industry, version 11. Available at www.dti.gov.uk/energy/whitepaper. Accessed 9 January 2007; Denniss, R., Diesendorf, M. and Saddler, H. (2004) *A Clean Energy Future for Australia*, a report by the Clean Energy Group of Australia.

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- Whole Systems Approach: *Factor 4* featured numerous case studies and examples in a somewhat isolated fashion, however, by linking different aspects of the case studies, higher levels of efficiency can be obtained. For example consider the case of the water-energy nexus for the average US household, considering that the average consumption of water per household is estimated at 1,350 litres.⁵ If you consider that on average electricity production from fossil fuels and nuclear energy accounts for 39 percent of all freshwater withdrawals and on average at least 100L of water⁶ is required to produce a kilowatt-hour from coal fired generation,⁷ and that the average consumption of electricity per household in 2001 was approximately 30kwh,⁸ then the additional consumption of water to generate this electricity is in the order of 750 litres per household.

In addition, searching for efficiencies across the system can lead to compounding savings. For example, the Columbia Lighting plant in Spokane, Washington, which operates around the clock, employs 600 people and has over 300 motors, including a 3-motor, 450 hp compressed air system. Fresh out of an Electric Motor Management seminar in 2003, Dennis Short and Scott Patterson of Columbia Lighting were producing a plant wide inventory of all motors when one of the three motors of the compressed air system, a 100 hp motor, failed. Their first option (the conventional method) was to replace the failed motor with a more efficient model. However, Short and Patterson found that replacing the motor would be twice as expensive as what they deemed cost effective. A second option was to first check for possible air leaks in the system using ultrasound techniques on the whole plant. Repairing the leaks reduced energy losses from both pressure drops and heat dissipation, and hence reduced the overall power requirement of the system. That done, week-long monitoring of the system revealed a 73 percent reduction in power requirements – 47 percent from repairing the leaks and a further 26 percent from improved controls. These power savings meant that just one of the original motors, a fixed speed 150 hp motor, could handle the load of the whole compressed air system.⁹

- The Historical and Political Perspective: In the first edition of *Factor 4* the authors illustrated that efficiency has been something that engineers have tried to achieve for a long time. *Factor 5* will further show that many of these ideas of efficiency are re-discoveries of old ideas. Moreover, the new book draws an historical parallel between the twenty-fold increase since the early days of the Industrial Revolution of labour productivity, and the prospects for increasing resource productivity sixfold and eventually also twenty-fold again.
- To Highlight that we Need to Rethink the Application of Engineering Design: Although engineering achievements have usually addressed and solved a number of problems, they have unfortunately often created several other problems within the broader system. Some of the profession's greatest achievements in the past are contributing significantly to the sustainability challenges we now face

⁵ US Environment Protection Agency (2006) *Using Water Wisely in the Home*, US EPA. Available at http://www.epa.gov/WaterSense/docs/waterconservation_final_508.pdf. Accessed 14 April 2007.

⁶ Sandia National Laboratories (n.d.) *The Energy-Water Nexus*. Available at <http://www.sandia.gov/energy-water/>

⁷ Furnaces to combust the coal are surrounded by water pipes to remove heat and produce steam in order to reduce the risk of the system overheating, in most cases this water is not recovered.

⁸ US Department of Energy (2005) *Energy Information Administration*, Regional Energy Profile, US Household Electricity Report. Available at http://www.eia.doe.gov/emeu/reps/enduse/er01_us.html. (Note: Updated figures are due in mid to late 2007)

⁹ Electric Motor Management (2004) *Motor management success: information, cooperation and teamwork lead to superior decisions at Columbia Lighting*, Electric Motor Management. Available at http://www.drivesandmotors.com/downloads/Columbia_SS_Final.pdf. Accessed 14 April 2007.

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globally. This is partly due to the lack of knowledge and interaction beyond each discipline and a lack of knowledge among many engineers and designers regarding ecology and its limits and thresholds. Two examples to illustrate this are the development of leaded petrol¹⁰ and the development of ozone destroying CFCs for air-conditioning and refrigerators.¹¹ While lauded at the time these discoveries have proven to be two of the most hazardous and destructive inventions in human history. The confidence in the value of technological progress has also led at times for scientific and engineering designers to be too quick to reach their conclusion. There has been an under-appreciation of the value of a precautionary approach to technological development.

- Outline the Ways Factor 4 has Influenced Governments, Business, Engineering Professional Bodies and Other Leading Decision Makers over the Last Ten Years: Since 1997, many of the ideas displayed in *Factor 4* have been taken up by leading businesses, governments, professional bodies, engineers and research organisations globally. Increasing resource efficiency by 'Factor 4' has become a mainstream idea in some countries around the world and in many multi-national companies. In *Factor 5*, the success of the original *Factor 4* book in mainstreaming these ideas can be demonstrated. Overviews succinctly the influence of these ideas for the first time helps to give them still greater credibility and help these ideas reach new audiences. To compliment and enhance *Factor 4*, *Factor 5* will again provide a range of institutional frameworks, policy mechanisms and strategies for institutions, organisations and governments to accelerate the achievement of a rapid reduction in resource use and the corresponding emissions and pollution.

This new book will focus on further developing the belief of Ernst von Weizsaecker and his colleagues in *Factor 4* that,

Factor Four means that the amount of wealth extracted from one unit of natural resources can quadruple. Thus we can live twice as well – yet use half as much... It heralds nothing less than a new direction for technological 'progress'. In the past, progress was the increase of labor productivity. We feel that resource productivity is equally important and should now be pursued as the highest priority... The next wave of innovation comes from the laboratories, workbenches and production lines of skilled scientists and technologists, from the ingenuity of engineers, chemists and farmers, and from the intelligence of every person. It is based on sound science, good economics and common sense. The goal is using resources efficiently; doing more with less... It is the beginning of a new industrial revolution in which we shall achieve dramatic increases in resource productivity.

¹⁰ US EPA (n.d.) *History of Lead*, US EPA. Available at <http://www.epa.gov/history/topics/perspect/lead.htm>.

¹¹ Elkins, J. (1999) 'Chlorofluorocarbons (CFCs)'; in Alexander, D. and Fairbridge, R. (eds.) *The Chapman & Hall Encyclopaedia of Environmental Science*, Kluwer Academic, Boston, MA, pp 78-80. Available at www.cmdl.noaa.gov/noah/publicitn/elkins/cfcs.html. Accessed 14 April 2007.

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Timelines and Milestones

1. Research and Preparation

The team is in the process of researching the latest reports, articles, references and resources to inform the development of the publication. In addition the team will issue a 'Call for Case Studies' to institutions, organisations and networks internationally to submit case studies for consideration for inclusion in the book.

2. Assessment and Validation of Case Studies

As cases are received the team will undertake an assessment and validation process to ensure that they represent verifiable performance. The case studies will also be scrutinised for a) their potential as teaching case studies demonstrating engineering design tools and methodologies with supporting metrics and b) from a policy perspective to learn from the governance in place to support and underpin the case studies' success.

3. Writing of Draft of *Factor 5*

Once the database has been gathered and the submissions of case studies received from around the world have been validated, the team will focus on the development of a draft. All case studies received and used in the draft will be cleared with the provider prior to draft dissemination.

4. Development of Online Companion

In parallel to the development of the draft the team will develop an open source online companion to support the book. The companion will provide additional material, detailed case study material to extend those presented in the book, references, and referrals to companies and research organisations active in the field. (For example see www.naturaledgeproject.net/NAON.aspx)

5. International Peer Review of Draft

The team will issue the draft for peer review to a select network of experts and advisors. As reviews are received they will be incorporated into the draft to form the pre-publication manuscript. Peer review will be focused on the chapter material, as the chosen case studies in the draft will have been verified by the authors. A range of reviewers covering government, business and academia will be invited.

6. Writing of Pre-Publication Manuscript Draft

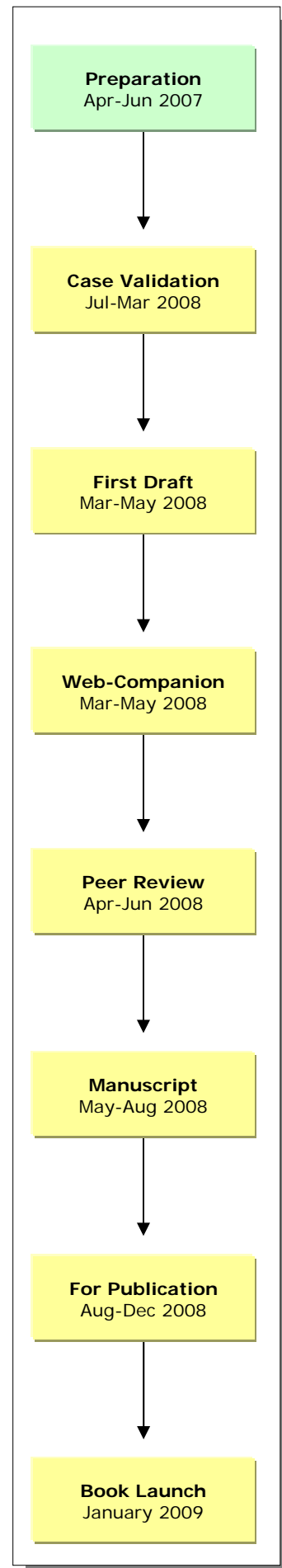
The team will work from the peer review received and update the content of the draft with current research and findings to develop the pre-publication manuscript. It is intended that the manuscript will follow a very similar structure to *Factor 4* however it will also have an emphasis on contributing to engineering education in both technical and policy related material.

7. Submitted for Publication

The preferred publisher is Earthscan/James&James as it was the publisher of *Factor 4*, that went on to be published in twelve languages. Already a Chinese publisher and a German publishing agent have expressed interest in *Factor 5*.

8. Launch of *Factor 5* and online Companion

It is intended that the Launch of the Book will be undertaken at an international forum related to sustainable development and engineering, in partnership with an international engineering organisation such as the World Federation of Engineering Organisations. The Club of Rome will also be informed about the development of *Factor 5*. The authors will present *Factor 5* as a potential 'Report to the Club of Rome', as with *Factor 4*.



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Content Map

PRELIMINARIES*

Forewords (Former Vice President of the United States, Al Gore, has been invited and is considering the contribution of a Foreword pending first draft of manuscript.)

Preface: *'Are we Destroying the World we are Creating?'*

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 - *The Services of Washing and Vertical Transformation in Building*
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 - *Server Design: RLX*
 - *Sliver Cells: Solar Energy Technology*
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 - *Motor System Retrofits (MSR)*
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 - *Can Hypercars and Wind Turbines be recycled?*
- *Water and Materials*
 - *Biowater – Biolytix™*

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 - *Sydney 2000 Olympic Games Village (energy, water and materials)*
 - *Dairy Processing (energy, water and waste)*
 - *Berrybank Farm Piggery (energy, water and waste)*
 - *Supply loop strategies: Metals recycling and reuse (to be added by Alexis) (energy, water, materials)*
 - *Cairns Crocodile Farm and Mulgrave Central Mill (energy, water, waste, pollution)*
 - *Queensland Nickel Refinery (energy, water and pollution)*
 - *Hammarby Sjöstad- The Sustainable City (energy, materials, water, waste, transport)*

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The Team Behind Factor 5;

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Dean of the Bren School of Environmental Science and Management at the University of Santa Barbara since January 2006. Previously served as the policy director at the United Nations Centre for Science and Technology for Development, director of the Institute for European Environmental Policy, and president of the Wuppertal Institute for Climate, Environment, and Energy. Von Weizsacker is a member of the Club of Rome and served on the World Commission on the Social Dimensions of Globalization. Later he became a member of the Bundestag, the federal parliament of Germany, where he was appointed Chairman of the Environmental Committee. Von Weizsäcker has authored several influential books on the environment, including 'Earth Politics' and 'Factor Four'. His many honours and awards include the prestigious Takeda World Environment Award and the Duke of Edinburgh Gold Medal, presented by World Wildlife Fund International.

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The Natural Edge Project (TNEP) is a partnership for research on innovation for sustainable prosperity. TNEP's mission is to contribute to and succinctly communicate leading research, case studies, tools and strategies for achieving sustainable prosperity across government, business and civil society. Driven by a team of early career Australians, the non-profit Project receives mentoring and support from a range of experts and leading organisations in Australia and internationally, through a generational exchange model. TNEP initiatives are not-for-profit. All support and revenue raised is invested directly into existing project work and the development of future initiatives. As the project's administrative hosts, The Institution of Engineers Australia (from 2002-2006) and now Griffith University provide oversight and financial accountability for the use of TNEP funds.



Our main activities involve research, creating training material and producing publications, which are supported by grants, sponsorship (both in-kind and financial) and donations. Our other activities involve delivering short courses, workshops, and working with our consulting associates as we seek to test and improve the material, and to supplement the funds required to run the project.



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