Sustainable development remains a formidable challenge both to industrialised and developing countries. The Wuppertal Institute’s study addresses this challenge with the concept of “eco-efficiency”, i.e. managing the economy better with less environmental pressure. Increasing prosperity combined with a reduction in the use of materials and energy – this is the paradigm of eco-efficient innovation and for a new generation of technologies that become more energy and material efficient, reduce natural resource requirements and use less space. “Factor Four” and “Factor Ten” are related concepts, bringing the normative dimension of “how much reduction might be needed” into the realm of business and policy-makers while striving for economic wealth. Factor 4/10 and the underlying concept on material flows have been awarded the prestigious Takeda World Environment Award in late 2001.

WI’s study presents eco-efficiency related European-based policies on material flows and energy with concluding views on any applicability to Japanese sustainable development policies. Such an exercise is ambitious and will remain imperfect. It is neither possible to give a full overview about heterogeneous approaches within Europe, nor will any study be able to transfer concepts from one country to another without unforeseeable impacts or infringing upon sensitive issues. However, Europe has cautiously started to develop tools to deal with material flows and energy which might be worth considering in similar Japanese debates. The underlying aim of WI’s study is thus a scientific communication. The final report offers some conclusions from previous analysis. The opportunity of the collaboration projects is gratefully acknowledged.

Though eco-efficiency can be undertaken at a profit at the company level, some well-known market failures such as negative externalities and information asymmetries will hinder markets from following that direction fast enough to cope with global environmental change. Policy has to address market failures via regulation. As many environmental, economic and social problems are interrelated, any single sector policy approach has limited effects and tends to modify symptoms rather than causes. A profound policy strategy should aim to sustain the physical basis of the economy throughout all sectors, improve economic performance, especially competitiveness, and social requirements, especially employment. It too should raise consumers’ awareness. Eco-efficiency can be proposed as the key to such an integrated approach. Indeed, integrative policies will remain imperfect and slow, and they might turn out to bear undesired effects on fragile markets too, but the point stands that policy has to play a role in fostering the eco-efficiency revolution. Framing the market conditions via legal and economic instruments can be regarded the general principle for policy makers when striving for sustainable development.

The rationale for integrating material flows into a sustainability strategy basically follows three directions of argument: i) environmental impact of materials matters either directly from landscape alterations or land use change, or indirectly from municipal solid waste or emissions resulting from both the extraction and use of materials, ii) scarcity of natural resources is a case in point, in particular for non-renewable resources, iii) only if material flows and energy inputs are considered, can resource productivity gains be expected. Looking
at waste policies (and the Japanese 3Rs strategy), a methodology for accounting material flows into and throughout the economy is demanded. The first interim report outlined such a methodology and presented statistics for comparing three countries (Germany, Japan, and USA). Clearly, such a measurement methodology still deserves further research. It also has to be underlined that the methodology offered has its limitations as to what extent it covers the overall need for environmental headline indicators. The first interim report outlined WI’s view on how material flows may fit into a broader system. Nevertheless, material flows and the ensuing approach of “dematerialisation” will become a necessary element, perhaps even a cornerstone in any sustainability strategy.

In relation to solid waste management, WI’s study suggests widening the scope of solid waste management towards an integrated sustainable resource management in order to achieve a “recycling-oriented society”. It is the volume, structure and composition of the entire material flow throughput of national economies and also of its physical growth, which determine to a large degree the quantity and quality of the resulting environmental pressure. If one intends to reduce the overall amount of solid waste, one ought to look at the input side of the economy via a “cradle to grave” approach. Preventing waste generation means using natural resources more efficiently through e.g. optimised production processes or extension of product life spans. Along these lines, the legal requirement of waste reduction ought to be translated into “dematerialisation” of an economy. A methodology for measuring material flows on the level of economies, regions and distinct enterprises has been developed and tested. It allows for measuring the resource productivity and can be drawn from WI’s reports as part of the collaboration projects.

In relation to issues on energy resources, energy efficiency technologies are one of the keys to harmonising global environmental issues and economic growth as well as equity concerns by developing countries. End-use efficiency fostered by market diffusion of the most efficient processes, appliances, buildings and vehicles is of paramount importance. As a conclusion from European policies, R&D policies should give higher priority to end-use efficiency and renewable energies. Policies should furthermore remove market barriers and create competitive markets for energy services, e.g. by demand side management as analysed in the study. A bottom-up scenario methodology for analysing the win-win options has been given in WI’s reports as part of the collaboration projects. Such a methodology is especially important when SME’s, local authorities and consumers ought to play an active role.

Eco-efficiency comes along with policy mix and policy integration. In Germany, for instance, bundles of legal and economic instruments have been implemented within the framework of climate policies. To foster the market for renewable energies, the German Renewable Energy Act has proven to be a successful approach to create markets for wind power, photovoltaic and biomass technologies; it is analysed in the study. German waste policies also attempt to set a coherent framework, but progress can be doubted. Consumer policy makes progress. A more comprehensive strategic approach for sustainable development policies is currently being developed. The European Commission is working towards the integration of environmental concerns into resort policies and is currently developing a thematic strategy on sustainable resource management, which may be expected to lay the ground for an integrative policy framework. Target setting is of special importance for stabilising expectations and gaining orientation on markets. EU is involved in setting targets for renewable energies, combined heat and power production (CHP), and in accelerating the growth of resource and energy productivity.

Against this background, the study analyses innovative regulatory policies. It introduces tools for governance across multiple arenas. The arena of policy-makers is at the heart of two
chapters: i) emerging European regulatory approaches for material flows, energy, buildings, transport, and target-oriented policies (chapter 3), ii) enhanced information basis via improved statistics and data (chapter 5). The selection and the overall structure looks as follows: Chapter 3.1 introduces the idea of an eco-tax on material flows. It rests upon the observation that materials flows, though they are of increasing importance and have been highlighted in WI’s first interim report, are still relatively remote from the policy agenda. The well-known debate surrounding any regulation, differentiating between economic incentives and the various legal instruments, has not yet started. But interestingly enough, some European states have begun to raise taxes on certain materials. These approaches are analysed with a view to exploring the frontier of economic incentives in the field of material flows. Compared to material flows, the following chapters can rely upon a long-lasting debate on regulatory policies. Chapter 3.2 and 3.3 introduce two distinct approaches of energy policies, featuring renewable energy and demand-side management. This is well in line with CO2 reduction efforts. Both approaches have been selected after a screening of various other concepts. Looking at the transport sector with its enormous importance for material flows and energy use, the study selects in chapter 3.4 the issue of raising energy efficiency of passenger vehicles. A last chapter deals with the cross-sectoral concern of setting targets. It is obvious that any regulation of material flows and energy deserves targets other than quantified targets for dangerous substances, which are well established in other areas of environmental policy. The chapter, therefore, analyses what kind of targets fit to eco-efficiency and how they might relate to an overall target-orientation.

Nevertheless, addressing policy-makers does not necessarily presuppose that this arena holds sufficient steering capacities. Governance across multiple arenas implies rather that business bears responsibility for the economy and for its various impacts on humans and nature. Analysing management tools for sustainable enterprises is a logical device following such a governance approach (chapter 4.1). Here, SMEs may be of special relevance as they dominate in the numbers of employees by far while offering potential for productivity increase. In addition, chapter 4.2 analyses sustainable consumption patterns. The objective lies in the identification of mutual lines between eco-efficiency, consumption and policies. The chapter analyses in particular the relation between consumption and the markets of energy and food.

Chapter 5 deals with the issue of bridging the data gap. It is widely known that both research on sustainable development, strategies and actions of policy-makers, business and interest groups critically rely on information. In particular long-term oriented scenarios, as useful decision-supporting tools (as analysed in WI’s first interim report) require data on certain items. Chapter 5 addresses the data gap in sustainable development policies. It responds to the needs of researchers and statistical offices who insistently demand data for various tasks. The chapter focuses on the study’s topics of material flows, energy, buildings and transport in their relation to the concepts analysed in the first interim report and lists the information and data requirements.