

The Swiss Approach to Sustainability

Challenges for environmental, energy, land use, and transport policies

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Introduction: A Long-Run Perspective

There are several primary targets for policies aiming at long-run development: increasing living standards, protecting crucial natural resources, and reducing the risks associated with economic and ecological crises. These aims can be conveniently summarised under the heading of “sustainability.” Relevant policy fields are easy to identify: they are all related to the scarcity of the natural environment, which provides services in terms of energy supplies, natural sinks, and space for human activities. Accordingly, in order to pursue a strategy for sustainable development, the future use of energy and land lie at the heart of both the problem and its solution. Despite this apparent simplicity, concrete policy proposals are not easily found, as they depend on fundamental evaluations of such crucial issues as the costs and benefits of policy instruments; the uncertainties and irreversibilities linked to natural resource use; the efficiency of regulation; the competitiveness of the domestic economy; and the dependence on foreign policies.

Currently, climate change is the most imminent sustainability issue. The business-as-usual scenario assumes that under *laissez faire*, worldwide greenhouse gas emissions would rise by 45 % by 2030, which would cause an increase in the global average temperature of up to 6 % by the end of the century.¹ According to the Stern Review, the warming could entail losses equivalent to 5 -10 % of global GDP.² Recent predictions of climate scientists suggest that strict policy measures have to be adopted within the next few years in order to achieve a temperature increase deemed merely moderate.³ In the meantime, countries must enact policies to adapt to some developments that appear inevitable, such as the increase in extreme weather conditions, floods and landslides. In addition, natural resource depletion, the future decrease in energy and mineral supply, and the loss of biodiversity are other critical issues for sustainability.

Recently, we have experienced a triple crisis in the fields of food, fuel, and finance. Prices for foodstuffs traded internationally increased by 60% in the first half of 2008; the oil price peaked at 150 \$/barrel; and banking failures caused huge government interventions. Thus, the financial crisis coincided with a heightened awareness of global climate change and its causes and consequences. While finance ministers were designing rescue packages to boost the economy, energy and agriculture ministers were facing record-high fuel and food prices, the latter brought on in part by the increasing agricultural acreage devoted to biofuel instead of grains production. Trade and per capita income growth are expected to have contracted worldwide in 2009, which implies one of the major economic downturns of the last decades. At the same time, new scientific reports have shown gloomy predictions of the environmental and economic impacts if global greenhouse gas (GHG) emissions were to continue unchecked.

The challenges of sustainability and the downturn of economic activities have reinforced the debate on the enlargement of sustainability policies and their implementation. This contribution analyses the different policy fields for the case of Switzerland. It aims at clarifying which policy measures are advisable and to what extent the traditional Swiss attitude of keeping market interventions at a low level is still adequate.

The remainder of the paper is organized as follows. In the first two sections we discuss the recent international initiatives on broad green policies under the heading of a “Green New Deal” and consider the application to the Swiss case. We then focus in the next sections on the different elements of these policies, notably on climate, energy, land use, and transport policy. The final section offers some concluding remarks.

Green New Deal

It is hardly surprising that the recent coincidence of multiple crises and awareness shocks should have produced calls for including “greening” measures in the government crisis-spending packages. These initiatives have been termed “Green New Deals”, evoking U.S. President Roosevelt’s Great Depression-era New Deal of the 1930s. The proponents of a Green New Deal (GND) see an opportunity to re-launch worldwide economic growth on a more environmentally-friendly path by including targeted measures to foster more less-polluting production processes, increase renewable energy use, and boost relevant R&D efforts, to name a few. The United Nations Environment Programme’s (UNEP) “Global Green New Deal” report sums up the objectives under three points: first, to revive the global economy, create jobs and protect vulnerable population groups, second, to reduce carbon dependency, ecosystem degradation, and water scarcity, and third, to further the Millennium Development Goals.⁴

Several countries have already designed their additional government spending packages in the spirit of a GND, or at least incorporated some of the suggestions into their own initiatives. South Korea has forged ahead by passing a USD 36 billion full-blown Green New Deal in January 2009 for the period 2009-2012. The policy package includes measures to develop public transport systems, especially rail transport; to increase the number of fuel-efficient vehicles and clean fuels; increase energy conservation and improve the energy efficiency of buildings; restore rivers and forests; better manage water and waste; and to create a green information system. The South Korean government also announced a new renewable energy fund totalling USD 72.2 million, intended to attract private sector investments in solar, wind and hydroelectric power projects.

China – which became the largest CO₂-emitter in 2007 – has adopted similar efforts at expanding public (rail) transportation, at improving energy efficiency and upgrading its electricity grid infrastructure. It has also announced more “direct” environmental projects such as better waste and water management, and environmental conservation efforts. In fact, the Chinese government is devoting more money to “green” initiatives in absolute numbers than any other country, not only in its crisis spending package, but also in its regular budget. Of the

total stimulus package of USD 586 billion, well over USD 200 billion are being spent on these direct “green” policies, with another sizeable portion having indirect positive environmental effects, for example via restructuring in the metals and mining industries and planning new, more energy-efficient housing projects.⁵

Denmark is using (part of) its USD 1.83 billion fiscal stimulus package to foster energy-sector research, which it plans to increase tenfold by 2012. The Danish government is also tightening the emission caps for industry and planning to use the tax revenues for a “green tax reform”, which will decrease labour taxes and increase pollution taxes. Furthermore, a green vehicle tax will give an incentive to buy fuel-efficient vehicles, and at the same time make it more expensive to use cars. Germany has announced a combined fiscal stimulus program of Euro107 billion (over USD 153 billion), of which some funds will be used to accelerate building modernisation, expand rail and water transport networks, and increase the number of fuel-efficient vehicles through tax breaks. However, critics point out that Germany is in fact spending only 13% of its stimulus package for “green” investments, behind the United States’ 17% and South Korea’s remarkable 70%.⁶ Many other countries, including the UK, the United States, and the EU, have similar provisions in their additional government spending packages, with measures aimed at fostering energy efficiency and renewable energy, transport and fuel-efficient vehicles, and energy-efficient buildings featuring most prominently.

One major concern of policymakers is the creation of jobs, especially in a time of economic crisis. Different studies show that the renewable energy and “clean” building sectors, for example, create many valuable employment opportunities. The green energy initiatives in the U.S. are expected to create 20% more jobs than more traditional fiscal stimulus policies; the renewable energy sector alone already employs around 950 million people in China; and energy conservation and renewable energy supply programmes in the EU are estimated to create 1-2 million new jobs.⁷ Green New Deals therefore promise not only to make environmental sense, but also to stimulate the economy and prepare it for more sustainable growth in the future.

In sum, despite early fears that the economic crisis would prove a major setback for environmental protection efforts, many crisis-spending packages are embracing environmental policies as useful instruments to help set economies on track for long-term growth – with benefits already in the short term. However, not all countries have assigned the same importance to green investments, with some aiming for true “Green New Deals”, while others’ measures to green the economy appear less decisive and subordinated to more conventional fiscal stimulus policies.

Green New Deal for Switzerland?

Green investment and creating a sustainable economy are not new topics in Switzerland; the debate on how best to combine economic growth with a healthy environment has been going on for several decades. For example, the need to transfer goods transports from roads to rail was first discussed in the early 1980s, after the opening of the Gotthard road tunnel started shifting part of the transit freight traffic from the railway to the roads. The “road-to-rail”

policy was formally written into the constitution as part of the “Alpine Protection Act” after a popular vote in 1994, and the new transalpine railway connections, called “AlpTransit”, are a major step towards this goal (see below). At the same time, a tax on heavy goods transports on roads (the Heavy Vehicle Fee) was approved, and the tax proceeds are being used to finance the AlpTransit project.

In the area of climate policy, Switzerland committed itself to an 8%-reduction in emissions between 2008-2012 compared to 1990 as a signatory of the Kyoto Protocol in 1997. After first relying on (insufficient) voluntary measures, the government introduced a fuel tax (“Klimarappen”) in 2005, and a CO₂-tax on combustible fossil fuels in 2008. The funds that are collected through these taxes will be used respectively to improve public transportation systems, and (in part) to finance building renovation. Moreover, the new energy legislation of 2007 introduced a feed-in subsidy for renewable energy, valid for 20-25 years depending on the type of energy resource.

The two examples above show that not all sustainability policy goals have proven straightforward in their implementation. In an overarching strategy paper published in 2008 for the period 2008-2011,⁸ the Swiss government delineated its vision for a sustainable future in eleven areas, including climate change and natural hazards; energy policy; spatial planning and transportation; the economy and financial policy; various social and human capital aspects; and global developmental and environmental challenges. The strategy calls for a better coordination among ministries and federal levels in the design and implementation of policies, and the federal government has established yearly evaluations to closely monitor the developments in each area. The first interim report was presented in June 2009 and shows both successes and failures.⁹ As regards environmental policies, for example, the CO₂-intensities of the overall economy, as well as of motorised passenger transportation, have already been reduced.

However, there is clearly room for more “greening” measures in Swiss policies. The three fiscal stimulus packages that have been passed since November 2008, totalling CHF 1.7 billion (USD 1.6 billion), have included over CHF 500 million (30%) worth of direct “green” measures, which are additional to the government spending already included in the regular budget. Although not explicitly termed “Green New Deal” measures, they certainly answer the criteria. The measures aim at improving the railway system through more maintenance work, expanding switching yards to improve network availability, and at increasing safety. Renewable energy and energy efficiency are being fostered through measures to replace electric heating systems with heat pumps, woodchip or solar heating; to set up district heating systems; and to realize solar power projects. The government is also financing building renovations that meet certain minimum energy-efficiency requirements (Minergie-Standard), and it is renovating its own building infrastructure to respect energy-efficiency criteria. Furthermore, over CHF 20 million have been allocated to environmental conservation efforts such as biodiversity projects, and another CHF 66 million are devoted to flood management measures. The third and most recent stimulus package also plans to invest CHF 15 million in the re- and continuing education of qualified workers that are interested in seeking a job in the energy and construction sectors, particularly in the areas of energy efficiency and renewable energy technologies.

Critics point out that Switzerland lost much of its technological leadership in the renewable energy sector when the initiative to foster solar energy and other renewable energy types was voted down in 2000.¹⁰ If the initiative had been accepted, it would probably have given a clear sign in favour of solar and other renewable energy technologies, and the country could have been well on its way towards fulfilling its Kyoto commitments. Part of the second stimulus package's CHF50 million devoted to R&D is intended to increase renewable energy-relevant research investments; whether this will be enough to regain a position at the top of the technology leadership ladder remains to be seen. Although Switzerland has no coal power plants, there is a need to find long-term alternative energy sources to the ageing nuclear power plants: again, this calls for investment in R&D and the construction of new energy generation plants. But is it possible to achieve economic recovery and sustainability at the same time, with the same kind of expansionary policy instruments? In principle, it is a valid point to direct government expenditures toward a greening of the economy, if these expenditures are carried out anyway. One could also argue that taxes and permit markets can have similar or better effects, without causing high deficits in public budgets. Moreover, it has to be noted that medium-run recovery is not the primary target of sustainability policies. For example, with regard to future living standards and risk exposure, sustainability calls for policies increasing energy efficiency rather than raising general capital investments. Further problems of green programs are the possible lack of mature energy projects (causing low efficiency of the policy measure) and possible high administrative costs. In Switzerland these issues are of relatively low importance as the size of the programs is very moderate. In the US and many EU countries, however, the efficiency and lack of green orientation is a serious problem. Some policies might (falsely) carry a green label, but in fact only aim at the survival of existing industries, like the German „scrap premium“ for automobiles.

To conclude, Switzerland – in common with other, mainly small European countries – has for several years been undertaking substantial measures to enable sustainable future economic growth, even before the idea of a Green New Deal took hold. However, the policies have not always been coordinated as part of an overall “sustainability strategy”, a realization which has only recently led to the design of a three-year overall strategy plan with regular monitoring efforts. The plan hardly encompasses the long-term time horizon that is called for, but it is certainly a step in the right direction. In some areas such as transportation and (partly) energy policy, Switzerland is relatively well-positioned to take on a leadership role for other countries.

In the following, we detail in turn what policies have been approved mainly during the last decade in the energy and transportation sectors, environmental protection, and land-use regulation. We also explain current discussions, and point out some of the weaknesses in the policies.

Climate Policy

Climate scientists forcefully argue that only a small time window of ten to twenty years is open to realise a marked turnaround in global greenhouse gas emissions. If this fails, the world's climate is likely to destabilize for a long time. The warming would affect water and food supplies and evoke more frequent natural disasters with huge economic costs. In late 2009, the nearly 200 signatories to the UN Convention on Climate Change convened in Copenhagen to discuss a successor treaty to the Kyoto Protocol. The reduction of climate-damaging greenhouse gas emissions, the adaptation to the impacts of climate change, the financial architecture for policy measures, and the diffusion of new technologies were the most imminent issues. As a result, the common target of maximum warming of 2° C was agreed with broad majority in the so-called "Copenhagen Accord", but concrete measures for the different countries have not been decided yet.

The pollution of the atmosphere emanates from a market failure, which has to be corrected by policy. But there are various obstacles to implementing strict climate policies. First, the attitude of "environmental scepticism"¹¹ is still widespread in the public and the business community alike. While the climate problem was first downplayed, the current critique is concerned with the cost-effectiveness of climate policies and international climate treaties.¹² However, public opinion now seems to support the view that the scenario of low adaptation cost to climate change is highly unlikely,¹³ which underlines the need for mitigation, i.e. significant climate policies. Second, one has to make sure that the costs of such climate policies are viewed in the right perspective. In particular, they have to be compared to the right benchmark, which has to include the damages of global warming. More precisely, "business as usual" is no longer a growth rate of around 2 percent per year but a long-term path where GDP is affected by climate change. Third, international policy coordination is an immensely difficult task. How can all the countries, and especially the big players, be motivated to enter into full cooperation? China has become the biggest polluter, but emissions per capita are still five times lower than in the U.S.; in India, per capita pollution is only half that in China. Moreover, with stock pollution problems such as the pollution of the atmosphere, past emissions have to be taken into account according to the polluter-pays principle. A future climate agreement has to allocate the abatement cost both efficiently, and also in a manner that is considered to be fair to the poor countries. In the end, the success or failure of climate negotiations will heavily depend on the efforts of the participating governments, which, in democracies, heavily depend on voters' preferences.

Fourth, the question for Switzerland whether to abate emissions domestically or in developing countries by using the "Clean Development Mechanism" (CDM) includes different aspects. At current prices, the use of the CDM appears to be cheaper i.e. more cost effective. But as international carbon markets are volatile, it involves a higher cost variation and thus a higher risk. Moreover, many CDM projects suffer from efficiency problems, meaning that the abatement effects may in fact be lower than officially stated. In addition, no country with CDM projects commits to any aggregate emission target, making the total reduction effect of CDM unclear. The big advantage of domestic mitigation comes in the form of secondary

benefits. These include better environmental quality at home, incentives for technology development, and lower exposure to the risk of lacking resource supplies. because when abatement is undertaken in the home economy, more income is invested domestically and less is used for energy imports.¹⁴ Through international technology diffusion, energy efficiency can spill over to other countries. The above-mentioned fairness in the international sharing of the cost of climate policies suggests that leading countries carry out a substantial part of mitigation domestically.¹⁵

Fifth, the possible loss of competitiveness is an important issue for a small open economy. While some believe Switzerland should completely abandon the idea of doing more than the EU where climate policy is concerned, others emphasise the first-mover advantages when adopting strict measures early. Two comments are appropriate here. On the one hand, absolute cost advantage should not be confused with comparative advantage, which is the ultimate source of international trade and the related welfare gains. In the long run, a country like Switzerland should not generally aim at low input prices, but rather seek to specialise in activities with a high value added allowing for full employment. On the other hand, it seems difficult or even impossible to identify chances for first-mover advantages without being involved in a business environment. There is no generally valid rule. If the future is not accurately predicted, one can also be too early or head in the wrong direction. The final obstacle is the fact that there is no tradition in Switzerland of the government taking the lead to guide economic development. It is true that the pioneers of the 19th century made much bigger economic steps than those planned in the field of climate policy. But then the impulse came from individual actors operating on markets, while today policy seeks the consent of market participants and voters to change general guidelines.

To best assess the cost of climate policies, we need to consider the impact of energy supply and energy policies on long-run growth, a point which we turn to now.

Energy Policy

The debate on energy policies is often dominated by contradictory predictions about future energy use. It is natural that energy producers and energy-intensive sectors should be actively engaged in the public debate, but their arguments need some clear qualifications. It is undisputed that limited oil reserves and climate change make it necessary to steadily replace today's dominant fossil fuels with cleaner sources of energy. Fossil energy sources will still be sufficient to facilitate the transition phase of the global energy system in the 21st century. But overall, emphasis must be placed on efficient decarbonisation of most energy system processes, with the long-run target of 1t CO₂ per capita. The global energy system can also be configured in a way which is compatible with the natural environment. It has been calculated that primary energy use amounts to between 2000 and 3500 W per capita in a long-run sustainable state. Some 1200 W per capita of final energy is required in the form of electricity.¹⁶

To evaluate the sustainability of a low energy society and the optimum transition to this state, economic analysis is indispensable. It requires some deeper understanding of a market econo-

my, as a decreasing use of an important input like oil has not been often observed in economic history.¹⁷ This might be a reason why the debate tends to move away from using basic economic knowledge. Specifically, in Switzerland the concern has emerged that decreasing domestic resource supply could cause an “energy gap” (too high demand compared with supply) in the future. Recent estimates suggest that Switzerland will witness an “electricity gap” in 2035 of 15 % of demand in 2035 and of 25 % in 2050.¹⁸ However, the calculation is “bottom-up”, heavily technology-based and overlooking the role of prices and the law of demand. The victory of market economies over planned economies was mainly due to the flexibility of markets in adjusting to new challenges. In this regard, prices play a fundamental role.

Assuming an elasticity of demand for electricity of -0.5, price increases of 30% and 50% would be perfectly suited to fill the predicted “gap”. In the case of long-term predictable price development, the elasticity may even be higher. Technologies, transportation, land use, and the international division of labour are all able to adjust to changes in energy prices. An increasing number of smart devices for heating and transportation will also further energy efficiency. In addition, there is room for productivity improvements in electricity distribution, which constitutes a large share of producer costs. The idea that consumers would behave particularly inconsistently when dealing with energy is rather peculiar. Behaviour in this case is as rational (or irrational) as in other consumer markets. Importantly, the consideration of markets and especially the demand curve provides the voters with a menu of the energy future from which to choose from, including price increases and/or the construction of different types of power plants.

It has to be acknowledged that the ongoing liberalisation of energy markets will increase the risk inherent in the construction of large energy facilities. Technological risks are increasingly supplemented by market and legal risks.¹⁹ Future regulation will affect the returns on nuclear or coal power plant investments, thereby also changing the profits of Swiss pump storage stations. Since the owners of the electricity firms bear the financial risks and these firms are furthermore still largely owned by the government and public institutions, possible losses would ultimately have to be covered by taxpayers. The current state of underinsurance of plants is in fact a subsidy to energy production.²⁰ As a private insurance solution is not feasible in the case of nuclear power plants, a possible other form of insurance would consist in issuing a forced loan to the public. This would yield a regular return but could be used for compensation payments in case of accidents. Thus, a vote for new power plants should in fact include insurance, e.g., issuing such a loan. That domestic production of energy is always better than imports with regard to security of supply is another fallacy of the current discussion. The electricity blackouts in Switzerland in the past years have been purely homemade. The best way to support a secure supply is diversification in production and transmission, which in the Swiss case necessarily includes foreign sources. However, it is correct that homemade production generates domestic producer surplus and employment, a point which should be weighted against the other issues.

The biggest challenge for the economic part of energy and climate research is to evaluate the effects of energy-saving policies on long-run income, welfare, and growth. A recent study concludes that the economic effects of a 20% (30%) reduction of Swiss CO₂-emissions (partly

realized abroad) by 2020 would be moderate, causing a decrease in income level of 0.69 % (0.94 %).²¹ Interestingly, the study shows that climate policies of the neighbouring countries are not essential, as losses of international competitiveness in certain sectors are compensated by gains in others. In a recent empirical study for a sample of 37 developed countries with five-year average panel data over the period 1975-2004, it is found that rising energy prices are not a threat to long-run development.²² On the contrary, conditions are shown under which decreasing energy input induces investments in physical and knowledge capital. According to the hypothesis of Hicks (1932), increasing input prices induce innovation, which in turn makes these inputs more productive. Thus, with an increase in energy prices, a substitution effect works in addition to the better-understood cost effect. Using industry data for different OECD countries, another recent empirical paper has found that rising energy prices reduce total factor productivity at the industry level, but when interacted with R&D spending, the overall effect is positive, significant, and strong enough to produce a positive net effect for most industries.²³ The International Energy Agency (IEA) emphasizes that the largest potential for improving future energy efficiency lies in the energy-intensive sectors.²⁴ Moreover, it sees good development perspectives for emerging economies, despite their increasing shares of energy-intensive sectors.²⁵ Along the same lines, another recent study finds that energy-intensive industries have performed much better economically under strict climate policies than previously expected.²⁶

In a series of recent studies, McKinsey & Company offer a detailed analysis of the magnitude of the greenhouse gas abatement cost curve, which has also been applied to the Swiss case.²⁷ They find that Switzerland has a „technical potential“ to reduce carbon emissions by 45 % by 2030, more than half of it in the transportation and building sectors. Moreover, 40-80% of all carbon saving measures are predicted to save costs, while investments to realise all technical measures would amount to 0.7% of GDP annually. On the more informal level of empirical observations, the international comparison of countries shows no positive correlation between economic growth and energy use per capita. In addition, the huge price increase of oil between 2003-2008 was well absorbed by the world economy. Also, according to a recent survey,²⁸ the energy shares in the Swiss machinery sector are relatively low, with 70% of the firms reporting electricity costs of less than 5% of total operating costs.

The different studies lead to the conclusion that moderately but steadily rising energy prices are compatible with ongoing growth. In the long term, market economies are very flexible and able to adequately substitute scarce inputs. Technology development will be increasingly directed towards the improvement of energy efficiency. For the future, the reduction in natural resource use will be a continuous process. Short-term shocks as in the 1970s should be avoided, because lower short-run flexibility means that fluctuations entail high economic costs. Long-run climate and energy policy should preferably operate with legally binding interim targets, so that the political responsibility can be monitored by the voters.

Transalpine transportation

Switzerland lies at the centre of several important transalpine transportation routes. Not surprisingly therefore, the organisation and control of this transboundary traffic has been a core issue for Swiss policymakers for several decades. The modal split of long-distance transportation between railway and road has been a particularly contentious topic. The completion of the Gotthard road tunnel in 1980 opened a new, direct connection between Germany and northern Europe and Italy in the south. It led to a rapid shift towards transport – especially of goods – by road instead of rail, and accordingly to a marked increase in traffic volumes along the main north-south route from Basel, on the border with Germany and France, to Chiasso, the main border-crossing into Italy.

The debate has revolved around how best to reconcile economic growth with the needs of the natural environment of the Alps, and the demands of the local population most affected by traffic flows, as well as the European trading partners. The main policy direction is clearly the transfer of transalpine transports, especially freight transportation, from the road back to the railway. This basic principle was voted upon in 1994 and inserted into the Swiss Constitution under the “Alpine Protection Act” (“*Alpenschutzartikel*”).²⁹ Its cornerstone is the new system of transalpine railway connections collectively termed “AlpTransit”.

The AlpTransit project, also called the “New Railway Link through the Alps” (“*Neue Eisenbahn-Alpentransversale*” – NEAT), was originally approved by the voters in 1992, but it subsequently had to be re-evaluated due to the changed economic situation. A scaled-down project was again put to the popular vote and accepted in November 1998, and it is an important part of the transportation agreements with the European Union.³⁰ AlpTransit includes two major new tunnels on two north-south axes: the Lötschberg Base tunnel on the Simplon line, and the Gotthard Base tunnel through the Gotthard massif. The latter is the single largest construction project of AlpTransit, and it will be the longest tunnel in the world upon completion. The new railway connections will enable faster and more efficient goods and passenger transfers across the Alps, with the ultimate goal of transporting the vast majority of long-haul freight traffic by train.

The detailed enactment of the road-to-rail policy relies on several articles in the Swiss Federal Law. The first of these laws, the so-called “Goods Transfer Law” (“*Güterverlagerungsgesetz*”) of December 2000,³¹ envisioned a maximum number of 650'000 transalpine freight journeys per year by 2009, an amount last seen in the late 1980s.³² However, this target has been missed by a wide margin: in 2008, 1.27 million trucks transported goods across the Swiss Alps, which is only 9 percent less than in 2000. Accordingly, the Swiss parliament has approved a new law in 2009,³³ stating that the goal of 650'000 annual transalpine journeys must be reached two years after the opening of the Gotthard Base tunnel, which is scheduled for 2017. A mid-term goal of a maximum of 1 million transalpine freight journeys per year has been set from 2011 onwards.

It is clear that AlpTransit, however massive the project may be, will not by itself provide the solution to Switzerland's long-distance transportation issues, particularly the traffic and road safety problems caused by freight transport vehicles. The total volume in transalpine goods

transport has been steadily increasing over the last three decades. The modal split between road and rail has remained more or less constant at over 60 percent in favour of rail, despite the fact that rail transport has increased by 38 percent since 1999 and that Switzerland transports more goods via rail than any other alpine country. This means that the number of trucks on Swiss roads has increased, putting further pressure on the nodal points along the main roads, including the single-bore Gotthard tunnel, and on the natural environment and the local populace.

The overall trend in transport volumes is subject to short-term business-cycle fluctuations, as goods transport is closely linked to economic performance. Road transport has generally tended to increase more rapidly than rail transport during an economic upswing, and recently to decrease less heavily during a downturn. According to a recent study,³⁴ the strong reduction in shipping orders during the economic crisis of 2008-2009 has led to over-capacities in road transportation. Because of the sunk costs involved in freight transport via road, for example the German annual road tax (“Maut”) implemented in 2005, it is difficult to reduce capacities in the short term. Therefore, hauliers have shifted some shipments from the railway to the road in order to minimize their losses, leading to proportionately greater losses in shipping volumes in rail transport.

In order to ensure the long-term viability of the road-to-rail policy, it is supported not only by major construction spending, but also by other measures such as the Heavy Vehicles Fee;³⁵ further investments into railway expansion and improvement; goods transport deregulation to increase competition; and subsidies for combined rail-and-road goods transportation (piggyback transports).

In addition to these measures, which are already being enacted, the Department of Environment, Transport, Energy and Communications (DETEC) is proposing a new policy based on market economy principles, namely the Alpine Crossing Exchange or ACE (“Alpentransitbörse”).³⁶ This measure, which is included in the newest Traffic Transfer Law proposal (GVVG), aims at establishing a system of tradeable permits for transalpine goods transports to reduce the number of heavy goods vehicles that cross the Alps every year. A fixed number of obligatory transit permits is to be auctioned off each year. Transport firms are then free to trade surplus transit permits throughout the year. The annual permit number will be based on the federal law targets mentioned above, and it will gradually be reduced to give the freight industry time to adjust; a suggestion is to set the first permit ceiling with about four years’ advance notice. The ACE permit auction proceeds are earmarked for rail infrastructure investments, the intention being to simultaneously develop a more attractive alternative transportation method via rail, for example the so-called “rolling road” (“Rollende Landstrasse” – RoLa) with piggyback transportation of freight vehicles. These alternative options can be optimised even before the completion of AlpTransit, a process which has already been initiated.

An important issue is the international coordination with the other Alpine countries. A unilateral implementation of the ACE by Switzerland would hardly be in accordance with the Overland Transportation Agreement signed with the EU. Moreover, the likely re-direction of freight traffic to other transalpine routes not subject to a permit system would not endear

Switzerland with its neighbors. Encouragingly however, the EU ministers and local authorities in the Alpine regions have shown great interest in the idea. A recent Swiss feasibility study shows that the ACE is technically and operationally possible and is suitable for daily use.³⁷ At the same time, it also recommends adjusting the Overland Transportation Agreement in order to introduce similar systems in other Alpine countries. In spring 2009, the transport ministers of Switzerland, Austria, Italy, Germany, France and Slovenia commissioned a further study on the introduction of the ACE across the whole Alpine region. In addition to the ACE, the independent research body is also expected to evaluate two other traffic management systems currently under discussion at the international level, proposed by France and Austria, respectively. Bringing in line the heavy vehicle fees of other countries with the (higher) ones of Switzerland is one; and fostering the diffusion of low-emission trucks and the trade of emission certificates is another option. In practice, the Alpine countries are considering a three-step solution to the common problem of transferring freight transport from road to rail: first, the emission-based policy, followed by higher vehicle fees, and finally a full-fledged cap-and-trade system such as the ACE.³⁸ At the same time, Austria and Italy in particular plan to increase and improve their transalpine railway systems, with a common project being the base tunnel under the Brennero massif.

In sum, the need to reduce transalpine road traffic, and especially long-haul freight traffic, and transfer it to the railway has been clear since the 1980s. The solution to the problem is, as often, less simple, and requires a combination of policy instruments. Unlike with climate policy, the Swiss government did not first try to rely on voluntary measures by freight hauliers; instead, it aimed at a combination of major railway infrastructure investment and various incentives to move goods transports off the roads. The ambitious AlpTransit project is the cornerstone of the first part of the policy measures; the Heavy Vehicles Fee, rail freight deregulation, subsidies for combined road-rail (piggy-back) transport, and the proposed new Alpine Crossing Exchange are part of the second group of policy measures.

The ACE proposal in particular is a very promising instrument. It would be relatively easy and cheap to put in place; it is based on market economy principles that provide clear incentives for changing the behaviour of hauliers; and it would enable reaching the freight transport targets of 1 million journeys by 2011 and 650'000 journeys by 2019 set forth in Swiss federal law. We should not allow these targets to be missed yet again: the road-to-rail and Alpine protection measures have received strong backing by the Swiss population in a series of popular votes since the early 1990s, and it is to be expected that, if put before a popular vote, the ACE would likewise be approved.

The issue of transalpine transportation necessarily involves other countries: getting these involved in the process and finding an agreement between the fellow transit countries – interested in limiting road traffic – and the other EU countries – interested instead in free and open transportation routes – will not be an easy undertaking. A pragmatic, stepwise approach may be necessary before a full implementation of an ACE will be possible, implying that the achievement of the road-to-rail goal may lie even further in the future. Nevertheless, given the clear support in Switzerland for the road-to-rail and Alpine protection policy goals and the costs necessary to achieve them, the Swiss government should boldly push for a rapid implemen-

tation of the ACE. In fact, it should go even further and aim for a reduction of heavy-goods transport journeys on the roads below 650'000 per year after the opening of the Gotthard Base tunnel. Special permits can be considered for domestic, short-haul transportation; but long-haul freight transport should definitely be moved to the railway once a fast and efficient rail transportation system is in place.

Spatial development

Individual mobility and spatial planning are closely linked, especially in a country as densely populated as Switzerland. The interlinkage of these issues has caused the Swiss government to explicitly call for a better coordination of spatial and transport infrastructure development in order to achieve a sustainable development path. The stated goal is a well-connected system of spatially compact settled areas that satisfy the needs of the population and the economy, as well as the natural environment.³⁹ However, Switzerland is yet far from following such a sustainable spatial development path, as a controversial report of 2005 pointed out.⁴⁰ Instead, urban sprawl and increasing private transportation continue more or less unabated. Land use has hardly been checked and lies at a rate of 1m² per second, while the share of public transportation in overall passenger transportation has been at a constant rate of around 20% for many years, despite major investment efforts.

As far as mobility is concerned, the reason is that the road infrastructure has also been improved, leading to an unbroken trend in parallel growth of traffic volumes and GDP. The road network however is unlikely to continue expanding at the same pace, as there are few major road-building projects still left uncompleted. On the other hand, the railway and other public transportation networks are being continuously improved and expanded, both for local and long-distance (domestic) passenger transportation. For example, it hasn't been long since the major network capacity expansion under "Railway 2000" was completed, yet the DEPEC is already launching a new major project under the heading of "Railway 2030".

The issue of spatial development is somewhat more complex than that of domestic mobility, since it is connected with the Swiss federal political system. While transportation planning and execution powers are assigned mainly to the federal level, spatial planning is more finely divided. The overall development strategy and monitoring functions lie at the federal level, while regional and sub-regional strategies and concepts, as well as the implementation, are left to the Cantons and local municipalities. This has led to an ongoing process of fractionalisation of the landscape, with construction areas reaching into former agricultural land while some areas within the building zones have been left untouched for various reasons. Construction has often not been undertaken with public transport access in mind, leading to more motorised individual passenger traffic. At the same time, there is in fact too much land designated as potential building land, providing a further disincentive for spatial concentration of settlements.

Since 2001, the federal government has been pursuing a more active role in the planning and organization of suburban areas. Following the report on land use and spatial development of

2005, a new “Spatial Concept” (“Raumkonzept”) was launched in 2006, with participation of all Swiss decision-making levels, representatives of the local population, and delegates from foreign cities in trans-border suburban areas. The agenda of the “Spatial Concept” includes agreement on the evaluation of the current situation; agreement on the definition of sustainable spatial development; the design of the actual “Spatial Concept”; and finally the political implementation. A draft “Concept” was presented in June 2008.

Shortly thereafter, in December 2008, the DEPEC presented the first draft of a fully revised Spatial Planning Law, which – although it includes several ideas of the “Spatial Concept” – did not draw on broad consensus decisions. The new law seeks to replace the outdated law of 1979 and makes some bold suggestions for improvement. In an effort to halt urban sprawl, cantonal planning was to be reinforced and directed towards “inward development” and a more efficient use of construction land. Building zones were deemed to often be too large: controversially, communities were therefore called upon to evaluate their real needs within five years of the new law; new zoning decisions were to be taken at the supra-communal level; owners of empty building land were to be forced to use their land for its designated purpose; and existing, but unused building land could be re-assigned to “building-land reserves” without full compensation of the owners.

Predictably, the draft law has met with widespread opposition, most vehemently from the construction and small-business associations, but also from the agricultural sector. In the meantime, the so-called “Landscape Initiative” (“Landschaftsinitiative”) is calling for a ban on new building land for the next 20 years to stop urban sprawl: a central point states that if new land is assigned to a building zone, then the equal area must be deducted from a building zone elsewhere. The federal government has been called upon to release its official statement on this initiative, scheduled for the end of 2009, together with a counter-initiative in the form of a partially revised Spatial Planning Law (instead of the full revision originally planned): the two proposals would then be simultaneously put before voters. This seems to be the likely outcome, since the full revision of the law promises to be a more lengthy affair. Experience shows that even in the event of a rejection of the initiative, a relatively close result of the vote may yet galvanise all parties involved in the discussion and ultimately lead to a more stringent revised law. The need for a new spatial planning law is clear: it can only be hoped that the final policy outcome will go far enough to effectively limit the negative consequences of urban sprawl.

Conclusions

Sustainability calls for consistent long-run policies, which are difficult to achieve given the generally much shorter time horizons of markets and governments. The need for international coordination makes it even more challenging to implement appropriate regulations. We argue that the transition to a long-run sustainable state, e.g. given by 1 t CO₂ emissions and 2000 W energy per capita, is best guided by a steady increase in prices associated with continuous reductions in the use of fossil fuels. However, a democratic system with limited power of the

government and a high degree of federalism such as the Swiss one runs the risk of delaying decision making, unless voters exert enough pressure.

The close relationship with foreign policies and markets is a major restriction, but at the same time, a major opportunity for domestic long-term development. The results from studies on the impact of energy use on economic growth suggest that the degree of autonomy might be substantially higher than expected. Given the limited impact of energy on costs and the huge possibilities of induced innovation, higher energy prices cannot be seen as a major threat to the Swiss economy. Moreover, the recent case of financial markets and banking suggests that efficient rather than weak regulation can generate competitive advantages for domestic firms.

The fields of transport and land use rely less on international coordination, at least where purely domestic issues are concerned. However, this does not make them less challenging for policymakers, as the example of the revision of the outdated Spatial Planning Law shows: the need for urgent reform is obvious, but the complex division of powers between different federal levels, as well as the conflicting interests of various economic and civil society groups, has made the decision making process no less arduous than if it were a major transnational issue. The final outcome of this process is still uncertain: it is to be hoped that the inevitable compromise solution will not lead to further virtually unchecked encroachment of human settlement on the natural environment.

In comparison, cross-border transportation seems a less contentious issue: the goals and instruments are clearer, and the broad public consensus for the road-to-rail policy, together with the clear assignment of decision-making power to the federal level, have resulted in a clearly defined, multipronged strategy, including both major efforts to increase railway capacity (most notably with AlpTransit), and parallel market-based policies to increase the price of long-haul heavy transportation across the country. The boldest measure yet among the latter category is the suggested creation of an Alpine Crossing Exchange (ACE). This again calls for international coordination, as it affects other Alpine countries. However, the objectives and costs are well enough understood to promise implementation within a decade or less.

A special task is the purposeful coordination of energy, climate, land use, technology, transport, and environment policies in a unified and consistent strategy of sustainable resource use. The federal administration has recognised the need for greater consistency of political measures in the different fields, but all the participants of the political process have first to internalise the necessity to increasingly link the different policy fields together.

Endnoten

1. Rogelj et al. (2009)
2. Stern (2007)
3. Rogelj et al. (2009)
4. see Barbier (2009)
5. <http://knowledge.insead.edu/Chinastimuluspackage090705.cfm>
6. http://www.fr-online.de/in_und_ausland/wirtschaft/aktuell/1776482_Keynes-ganz-in-Gruen.html
7. Barbier (2009)
8. Schweizerischer Bundesrat (2008)..
9. IDANE (2009)..
10. Speech by Federal Councillor Moritz Leuenberger, March 28, 2009, www.uvek.ch/dokumentation/00474/00492/index.html
11. See the book title of Lomborg (2001)
12. Lomborg (2009) thinks that the costs of climate policies are too high, making adaptation cheaper than mitigation; he states that international treaties should cover technology diffusion and that it would be better to pay subsidies to research rather than emission-reduction projects.
13. Neue Zürcher Zeitung, 19.9.2009, lead article, front page
14. OcCC (2009)
15. OcCC (2009)
16. Energy Science Center (2008)
17. Notable exceptions are CFC gases and asbestos.
18. Energietrialog (2009)
19. Construction problems and cost increases are currently observable at the third-generation nuclear power plant in Olkiluoto, Finland.
20. It has been estimated that if Electricité de France (EDF), the main French electric utility, were required to fully insure its power plants with private insurance, using the current internationally agreed limit on liabilities of approximately 420m, it would increase EDF's insurance premiums from 0.017/MWh, to 0.19/MWh, thus adding around 8 per cent to the cost of generation. However, if there were no ceiling in place and an operator had to cover the full cost of a worst-case scenario accident, it would increase the insurance premiums to 5/MWh, thus increasing the cost of generation by around 300 per cent, see Leurs and Wit (2003), p. 132.
21. See Ecoplan (2009)
22. See Bretschger (2009)
23. Cadot et al. (2009)
24. IEA (2008), p. 112
25. IEA (2008), p. 115
26. Demailly and Quirion (2008)
27. McKinsey (2009)
28. See Swissmem (2009)
29. "The federal government protects the Alpine region from the negative impacts of transit traffic.

- [...] Transalpine goods traffic from border to border is carried by rail.” Bundesverfassung (SR 101), Art. 84, Abschn. 1-2.
30. Switzerland has signed an Overland Transportation Agreement with the EU as part of several bilateral accords. The EU has designated the rail connection between Rotterdam and Genoa, known as “Rail Corridor A”, as one of the six central traffic axes of Europe. Rail Corridor A passes through Switzerland.
 31. Bundesgesetz zur Verlagerung von alpenquerendem Güterschwerverkehr auf die Schiene, SR 740.1
 32. The Goods Transfer Law stipulated that the maximum number of 650‘000 annual transalpine heavy-goods journeys should be reached at the latest two years after the opening of the Lötschberg Base tunnel, which was put into operation in December 2007.
 33. Bundesgesetz über die Verlagerung des alpenquerenden Güterschwerverkehrs von der Strasse auf die Schiene („Güterverkehrsverlagerungsgesetz“, GVVG).
 34. see Stölzle and Kudla (2009)
 35. „Leistungsabhängige Schwerverkehrsabgabe“ (LSVA), based on Art. 85 in the Constitution and in place since 2001. The LSVA is higher than similar taxes in other European countries, for example Germany or Austria.
 36. The Alpine Crossing Exchange was originally proposed by the Alpine Initiative, a non-governmental group dedicated to protecting the Alpine region and its environment from over-use.
 37. Bundesamt für Raumentwicklung (2007)
 38. Neue Zürcher Zeitung, „Europäische Verkehrspolitik tief im Gotthard“, July 18, 2009.
 39. Schweizerischer Bundesrat (2008)
 40. See Steiger, U. (2005)

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