Transport Systems to Suit People and the Planet

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The problem of rising demands for mobility versus the need to reduce the CO₂ emissions from car traffic makes mass motoring, on a global scale extended to all peoples, an impracticability. Will the nations of the world, sometime around the year 2025, have to reach an international agreement on mandatory quotas of public transportation, to decrease the number of engines? The paper discusses a systems approach as a base to deal with this “glocal” dilemma.

One solution might be to give urban networks in intermediate regions a greater role to play in future. If so, ecologically sound and versatile vehicle systems must be developed for these regions around the world — within a dialogue between “North” and “South”. Such a perspective also opens up new opportunities to obtain more sustainability in the urban structures and the already built environment. This could have an important social and cultural impact on regional welfare and the economy: regional urban networks can develop into attractive sustainable societies.

Keywords: welfare, mobility, mass motoring, global warming, systems approach, intermediate regions, urban networks, vehicle systems.

Our present transport system is hardly sustainable in the longer term inasmuch as it is based on non-renewable energy resources and has unacceptable impacts on the environment — locally, regionally and globally. A variety of measures will be required to create the preconditions for cost-effective and environmentally sustainable transportation. It will be necessary to apply a systems approach, in which vehicles and fuel are considered in broader context of infrastructure and political-economic steering instruments of various kinds. (Supplementary budget estimates of the Swedish Transport and Communications Research Board, Kommunikationsforskningsberedningen; Fördjupad anslagsframställan 1996:1, s.39.)

A “GLOCAL” DILEMMA

If we take the problem of CO₂-emissions and global warming at all seriously, the wealthy nations of the world will be compelled, in the course of but a few decades, to reduce their emissions from traffic by 60–80 per cent. This will be necessary as the rapidly growing populations of the poorer countries increase their ownership of (conventional combustion engine) automobiles in their efforts to achieve the same degree of mobility as we have in the West, a factor which is generally seen to promote general welfare. (World Watch Institute and others.)

In earlier phases of the history of our planet, the atmosphere contained far too much carbon dioxide for higher forms of life as we know them today. Over millions of years, plants and algae fixed much of this gas; their remains turned into depots of fossil fuel. When we now burn this fuel on a mass scale, carbon dioxide is returned to the atmosphere. The main problem facing us is not that oil, coal and natural gas reserves will be depleted, but that — long before this happens — the environmental impacts of fossil fuel usage will have become intolerable: extensive burning of such fuels changes the atmosphere so that incoming solar radiation is not reflected back out into space as much as before; the resulting warming effect on land and sea will gradually render our planet uninhabitable. The process is complex and may be likened to winding the biological evolution of millions of years backwards in an accelerating tempo. (The National Environment Protections Board, The Swedish Commission on Climate Change, the Intergovernmental Panel on Climate Change, the UN Environmental Programme, and others.)
Even if we could find ways to replace fossil fuels with other energy sources quickly enough and on a large enough scale to make a difference, mass use of automobiles would still remain a problem of catastrophic dimensions: it would require a staggering amount of energy, the production of which would jeopardize other vital needs such as food, industrial production, heating etc. This is what is meant by saying we would need “several planets” if everyone in the world started consuming resources to the extent that we in the industrialized countries of the world do today. (World Watch Institute and others.)

Mass use of the automobile on a global scale can thus be ruled out — but some use of it may not. What can we do instead to allow all of us the needed mobility? Can we hope to devise and implement transportation systems — in collaboration with North and South — which can provide welfare-generating mobility on an equitable basis with fewer motors in operation?

Will the nations of the world, sometime around the year 2025, have to reach international agreement on mandatory quotas of public transportation (as they already agree on fishing quotas today)? They will be forced to do so, unless they can manage to solve the problem of CO₂-emissions in some other way. If we recognize the inevitability of having to cut emissions, how might we turn the situation around so as to create a more liveable, equitable and democratic world than we have today?

Are there solutions, presently hidden from view, which besides reducing the number of ignitions “per second”, and thereby emissions (CO₂, SO₂, NO, etc.) and energy use, might also afford greater welfare in other respects?

**SUSTAINABLE TRANSPORTS IN SWEDEN**

The problem of transport needs contra ecological sustainability is currently under study in several Swedish government committees and commissions, the most central of which is the parliamentary Communication Commission (KomKom). A KomKom report published in March 1996 indicates that agreement has been reached on measures between now and 2020 that (nearly) fulfill the goals for CO₂ emissions: a reduction of 10% by 2010 and 20% by 2020. More than 50% will have to be eliminated in the ensuing thirty years (2020–2050) if Sweden is to succeed in her ambitions, codified in international agreements. KomKom proposes three main measures:

* bio-fuels shall account for 15% of the fuel supply in 2010
* strict requirements regarding the fuel effi-

Not to interfere with current infrastructural projects — perhaps a prerequisite to reaching agreement — KomKom discusses the period up to 2020 without any reference to what is to follow. Consequently, the Nordic Institute for Urban and Regional Planning (NORDPLAN) is asked to try to predict “what Swedish society will look like” given fulfillment of the nation’s emissions goals (≤75% CO₂) and to outline a number of different scenarios leading to that goal. NORDPLAN is to report in June 1996.

Will NORDPLAN properly evaluate the potential in flexible IT-based (Information Technology) vehicle systems for public transportation of passengers and goods? Or have the dice once again been fixed, weighted in favour of the status quo in the belief that it is the only guarantee of an open, democratic society?

More important than hastily sketched scenarios is an entirely different aspect, namely, the political consensus in Sweden on democratizing decision-making concerning regional infrastructure and transportation. Intelligent and environmentally sound solutions may receive a better hearing in such fora. The powerful trust combining large-scale, publicly financed (“to create jobs”) investments and the interests of the petroleum and automotive industries (to satisfy their needs for profits by selling fuel and cars), which has prevailed until recently, may be replaced by democratic visions of the future, in which environmental concerns (Agenda 21 issues) play greater role. New solutions will doubtless emerge in the context of democratized transport politics in the ten to twenty years we have at our disposal. The recent directive to the National Road Administration to undertake a new study of public transportation and to cut investments in new road construction in half is a sign of the times.

The idea of decentralizing and democratizing regional transport planning is a fruit of growing consciousness which has gradually developed within both the “green” movement and local government in Sweden since the 1970s. Indeed, twenty years later, we find the National Environment Protection Board and the National Board of Housing, Building and Planning in key roles. The new emphasis — after several ziggs and zags — rests on maintenance of existing roadways and searching for new ways to organize transportation more efficiently, among other things with the help of information technology (IT). These foci may be expected to generate new thinking concerning
flexible regional mass transport, in which IT can play a significant role — as opposed to IT’s essentially controlling, limiting role vis-à-vis your traditional spirit of freedom while driving a private car.

The Commission of Productivity (Produktivitetsdelegationen, 1989–1992), which paved the way for the giant infrastructural “packages” we Swedes are currently involved in today, had a starkly contrasting approach: Invest large amounts of domestic capital in new road construction, let the rolling park swell, then control it and discipline it with the help of IT. This strategy might still prevail had not, in the early 1990s, the supply of domestic capital suddenly dried up; a problem which Sweden has approached the EU about in hopes of fresh money. The focus in EU, however, under the influence of Commissioner Neil Kinnock, currently lies on public transportation. Furthermore, in an European comparison Sweden already has a highly developed road network of extremely high standard. Our need for assistance is not convincing.

In 1993, the twelve county administrations in Sweden were asked to render the transportation system more ecologically sustainable. The project was entitled RES (Regional Social Planning for an Environment-Friendly System). The counties’ responses indicate that they do not expect to be able to fulfill Sweden’s goals regarding CO₂ emissions; the measures believed feasible reach only half-way: a reduction of approximately 15% by the year 2010. The other half will have to be achieved by more stringent fuel efficiency criteria for new vehicles and new vehicle systems, which can perform the necessary logistical services with fewer engines in operation.

The RES study does not include any suggestions concerning how to proceed further beyond 2010 to achieve the additional 50% reduction in the interval 2020–2050, which would mean long-term sustainability. A protocol from the regional committee for comprehensive planning in Falun and Borlänge in the county of Dalarna (October 1995) states:

It should also be noted that the assessment concerns the goal for carbon dioxide in 2010, a reduction of 15% in relation to 1990. A tightening of measures of the same type as mentioned in the example may yield a reduction of an additional 15%. In the longer term, however, a reduction of up to 75% will be necessary in relation to 1990. It is hard to say today how it might be achieved. In other words, the risk is great that in the period beyond 2010 it will be necessary to adopt rather severe measures to

limit/cut back automobile traffic. It is difficult to say exactly when this point will be reached and the consequences it will have. What we can do today, however, is to plan all new estates and other land development with the concomitant transport needs firmly in mind. (P. 31, author’s translation).

Car use will most probably not decline notably compared to the present; it is rather a question of reducing the rate of increase. Car travel is expected to increase by 40% between now and the year 2020. Mainly women and pensioners are expected to account for the increase, as they carry on habits developed in younger years. Car advertising targets these groups especially today. The proposal of the parliamentary commission on communication is rigged in such a way (–fuel consumption+CO₂–tax) that it will actually be cheaper to drive (a new) car in 2005 than it is to drive a car today!

If, on the other hand, it proves possible to accommodate that 40-per cent increase, plus a good share of deliveries, light goods and eco-cycling transports with new, flexible, regional transportation systems (i.e. using fewer engines), sustainability may be within reach. Properly designed, the solution can enhance the general welfare, equality and regional balance at the same time as it operates within the limits of Agenda 21.

Not least, such a “well-lubricated” system of intra-regional transportation might open the door for a system approach that would reduce the great distance our food travels on its way to our table! As long as international transports have the advantage of tax-free fuel, even the most trivial consumer goods will continue to be transported around the globe rather than be produced in the region where they are consumed. The question of food transport is intimately bound up with that of sustainability and our living standard/welfare in the long run. An efficient/flexible regional public transport system could in this respect promote regional self-reliance, local production and cultural identity. The market mechanisms could in many ways be more developed in such a society than is the case when local production erodes and international trade and transports are controlled by a few, strong actors.
The transportation concepts, IT infrastructure and socio-economic structures (local/regional carriers, local production, small-scale enterprise, etc.), which ecological sustainability calls for, should be thoroughly researched and developed. Regional university colleges should be encouraged to engage in R&D (research and development) in dialogue with local authorities and companies in the transport sector, for example, regional passenger traffic planners and carriers, taxi companies and freight carriers, and the various bodies and firms concerned with eco-cycling. The appropriate UN organs should sponsor international symposia to facilitate “north–south” collaboration concerning ecologically sound vehicles and transport systems. (Cf. Scientific American, March 1996.)

A SYSTEMS APPROACH

1 Can welfare be generated if communities in moderately populated, semirural areas form “commuting regions”, coordinating their labour markets, services and educational facilities across community boundaries? How can such regions’ transportation needs be met without unrealistically costly rail-bound services or environmentally ruinous reliance on automobiles?

2 Can welfare be generated through less — or more local — mobility, which is not so dependent on automobiles? For example, by introducing/keeping/recreating patterns of interaction and exchange between town and country and perhaps even “ruralizing” urban regions? How can light transportation vehicles and aids for local use facilitate local mobility and interaction?

3 Can welfare be generated through use of information technology instead of car-based mobility? Will this displacement occur spontaneously, or does IT perhaps generate new needs for mobility, which may come to be satisfied by even less environmentally sound means? Will it be necessary to apply steering measures, i.e., make car use more expensive, for IT to have such an effect?

4 Can welfare be generated by achieving mobility via traditionally inflexible modes of public transport (especially trains) or local rail systems? Or do express trains with few stops, accessed by car, instead cement our dependence on the automobile? Do regional rail systems serve a large enough share of the built-up environment? Can they accommodate light means of transportation (electric carts, bikes etc). Do rail-systems, such as automated people movers, have to be so costly that they displace or reduce other means of public transport? In other words: do they in effect simply make room for more cars on city streets?

5 Can welfare be generated through strategic land-use planning and localization of services, etc., so as to facilitate mobility via public transportation? Or is this kind of plan-
ning of such a long-term nature — given a low rate of building, administrative restrictions and conflicting private interests, and increasing demands on resource-saving re-use of the physical plant — that the effects on atmospheric emissions/energy use would be negligible at best?

6 Can welfare be generated through flexible local-regional systems of multi-use vehicles for passenger and goods transport, which can also accommodate individual transport aids and light vehicles? How can such systems, with the help of IT, be made flexible, i.e.:

* convertible between passenger and goods transports
* exchangeable/optional modules for different types of service and logistical programmes
* variable volume
* adaptable to different users and market segments (social and health service transportation, recycling transports, rural services, charter traffic, etc.)
* rail-to-road/road-to-rail convertible (and possibly driverless in some situations), so that the system is attuned to seasonal, weekly and daily fluctuations and rhythms in order to achieve a high overall degree of system utilization?

The perspective noted in points 1–6 can be incorporated in a system concept, in which 6 assumes a “catalytic” role in relation to the other five points, in the sense that:

**Point 1** is supported by the versatility of 6, which makes it possible to offer frequent services, even during low traffic periods. Such a solution means a major reduction of CO₂ emissions, inasmuch as about 80 per cent of all mobility — the world over — involves destinations within 100 km (60 miles), if this will lead to less use of cars.

**Point 2** benefits from the flexibility of the solution outlined in 6, which facilitates and stimulates town–country interaction. Not least every day services, eco-cycle flows, supply lines to small scale industry, social services and school transportation represent vital exchanges of considerable social and human value (providing security, the satisfaction of mutual needs, cooperation, etc.).

**Point 3** is supported by the potential of IT systems built up in private enterprises and households to interact with the IT systems needed in vehicle systems, of type 6, in order to make optimal use of the system’s flexibility.

The system outlined in point 6 benefits **points 4 and 5** by feeding passengers and goods to less flexible (rail-bound) public transport solutions, which will improve their efficiency. Since changes in the built landscape take place only slowly and after much deliberation, systems of type 6 can help “still poorly located” areas to function as though they already were “on the main line”, i.e. on routes, at nodes and in areas that are easily served by public transport systems, long before the overall structure is in place. This can help create a population base for the expensive rails, the introduction of which might otherwise be hard to justify. (Note: Rail-bound means of transport involves least friction compared to the other modes of transport on land and, therefore, generally speaking, is the most energy-efficient if it is well used.)

If, on the other hand, mass use of automobiles is allowed to develop unhindered, it will be necessary to impose an overall ceiling on CO₂ emissions, which implies drastic reductions in other fossil fuel use — for heating, industrial production, food supply etc. The outcome of such a development would most likely be heavier reliance on nuclear power.

The fossil fuel savings that might result if the systematic objectives outlined in points 1–6 above can be implemented successfully may be applied to other sectors of the transport system: air travel (for long distances), heavy lorries (unavoidable on short routes), shipping (which is energy-efficient) and residual automobile use. Cars are needed where they work best: for necessary transport on irregular routes between irregular points at irregular times and for leisure excursions! In future one may well own a car, but it will be expensive to use it, since the environment cannot tolerate the number of vehicles/engines in operation which present price levels permit/encourage. Generally speaking:

*If every household on the globe is to drive a car in future, then everybody also has to use public transport several times more (than the car). That is not just a solution — it is a good democratic one — since it solves a collective global dilemma in a just way on the local level.*

**INTERMEDIATE REGIONS**

Discussions of infrastructure generally relate to conditions in metropolitan areas. One tends to see the world as being composed of two categories: metropolitan cities and countryside bordering on sheer wilderness. Scandinavia, however, does not fit this picture. Here, fully half the population live in intermediate regions which include several towns, lesser communities and a populated countryside. The number of people living in such areas has slowly but steadily increased over the past century. Sweden’s rural population has not diminished significantly; unfortunately, service and job opportu-
nities in rural areas have.

If certain practical aspects of life in Sweden’s moderately populated regions could be improved, there is reason to expect that many people will find these regions quite livable and quite attractive. In many ways you are already “half way” to reach the future sustainable society in the intermediate regions, since there are still structures and resources to use and restructure for sustainability. Life in metropolitan areas and their artificial bedroom-suburbs is hardly likely to be every other Swede’s first choice, particularly if job opportunities in the city are no better than anywhere else.

Seen from this perspective, current plans to invest thousands of millions of crowns in metropolitan infrastructure — systems which are not only in the wrong place, but of the wrong kind — seem a tragic, inflationary misappropriation of the country’s wealth, albeit they may in the short term be veritable Klondykes for the contractors who build them and the architects who provide the garnish.

One “problem” in intermediate regions, some find, is that speculative investment is not as strong a motive here as it is in the metropoles. The concept of asking people to pay a premium for easy accessibility (road pricing, etc.) is almost unthinkable, and potential El Dorados for real estate developers are few and far between.

What kind of infrastructure is feasible without the motor force of speculative investment? What enhances daily life in these intermediate regions and has the character of infrastructure, but not speculation?

Answer: Overcoming the distances and the relative sparseness of the population which are the logical consequences of the favorable balance between built and unexploited land, which in fact defines these regions.

How can households’ “reach” be increased without relying too heavily on increasingly costly automobile use? How might one integrate labor markets across community “frontiers”? How can the services offered in different communities combine forces so as to top what metropolitan-dwellers have access to? How might better transportation facilities promote recurrent and higher education?

Accessibility is a key word, as in all social planning, but it can be provided by new and different means. Only those modes of communication whose environmental impacts satisfy the requirements of Agenda 21 programmes for sustainable development are worth considering.

“Vision: Sweden in the year 2009”, a project of the National Board of Housing, Building and Planning — in cooperation with other governmental boards — is the main context in which such alternatives have been discussed to date. The project document contains the first official discussion of the role of the intermediate regions in the context of ecologically sustainable development. The “Vision”, however, was promptly and harshly rebutted by advocates of private transportation by car, the henchmen of the automotive industry and trade. Their critique points to an essential error in the “Vision” which will require a good deal of attention, if the proposal is to have any chance of being realized.

“Sweden in the Year 2009” rules out the automobile as the main mode of transport in the extended commuting regions the scheme envisages. The reason: the environmental impacts, plus the simple fact that it is too tiring to drive 150–200 km (90–125 miles) a day. The document proposes a rail system instead. Advocates of automotive transport wonder how such a small population base as most of Sweden offers will be able to support regional rail systems.

Moreover, rail systems do not serve enough of the territory to properly serve the population structure (clusters of communities) which we have inherited from past eras or the new diffuse structures characteristic of the automotive era (urban sprawl). This, the crucial fault in the “Vision” scheme might have been avoided had the architects of the scheme “only” asked:

What are the guiding principles for creating transport systems in intermediate regions which do not require costly rail systems, which a cover good share of the area in question without extensive reliance on cars, which are economically viable and afford better safety and more comfort than automobiles can offer, which are accessible to everyone and, furthermore, can handle a good share of our ecocyclical transports, all in an ecologically sustainable fashion (Agenda 21)?

VERSATILE VEHICLES

An answer that satisfies all these criteria is probably a system with road vehicles which can use rails where such exist, systems which do not require costly and disruptive construction work, but use existing infrastructure. In such systems the vehicle is the intelligent factor and it is the vehicle which bears the wear-and-tear, is recycled and undergoes continuous product development in a dialogue between society, consumers and industry, within a “north–south” cooperation.

Take some of the money from questionable and stupendously costly infrastructural projects and let researchers and students in the new universities in intermediate regions study and de-
velop the versatile, intelligent vehicles which ecologically sound transportation systems require!

Participation on the part of major Swedish-based firms like SAAB, Volvo and ABB would be more than welcome, but it is equally important that local traffic authorities take part so that they can increase their competence as buyers of the relevant technology.

If funds were made available, it would most likely be only a decade before such technology attracted customers abroad, since the market will be extra triggered by the CO$_2$ problem. Export of vehicles is potentially far more lucrative for Sweden than "export" of tunnels, concrete bridges and "highway spaghetti", which, the record shows, no longer generate many jobs for construction workers. Do invest in such an automotive industry instead of "infraconstruction" or: identify such vehicle systems as an intelligent form of meta-infrastructure in themselves!

In August 1995, Volvo presented a futuristic concept for lorries and buses for use in congested urban situations with strict environmental requirements. Hybrid engine technology (the "KTH engine": electric + high-speed gas-driven turbine), four-wheel steering, active suspension, IT back-up for the driver, etc., are some of the ingredients in this concept. The bus version has its package for power transmission in the ceiling, so that the floor of the bus can be lowered to sidewalk level ("kneeling bus"). If Volvo’s plans will be realized around the turn of the century and are further elaborated to meet the demands of versatility which use in intermediate regions calls for, we could begin to see the contours of a vehicle/transport system which can help to realize the best intentions of "Sweden in the year 2009" with respect to eco-cycling and sustainability.

What these regions need in the way of infrastructure is not so much "construction" as more flexible, clean and attractive vehicles for frequent, efficient and economical public combi-transport. Vehicles which accommodate passengers and light-goods, including eco-cycling, serve various publicly financed transport needs and can travel by road and rail in future.

Moderately populated intermediate regions will then require a system of public transportation just as — almost precisely a century ago — the economic elite in Stockholm’s wealthier suburbs acquired electrified rail links with the city and — almost half a century ago — the public of Stockholm acquired its underground rail system. Otherwise, what will happen? Or where will it happen?

CONCLUSIONS

By way of concluding, I would like to make the following recommendations:

1. Initiate a programme of nationally coordinated and regionally endorsed academic research on new, flexible regional/local public transport systems. Let this research be carried out with extensive input from the public, hand in hand with the regional democratization of transportation policy recently proposed by a parliamentary commission (Kommunikationskommittén, 1996).

2. Initiate nationally coordinated and regionally endorsed academic research on

   * how small towns, as nodes in transport networks in intermediate regions, can be developed into close-knit and attractive centres — for everyone and for all seasons (including the Nordic winter), thanks to reduced car use and new, intelligent forms of public transit.
   * the function and design of the built environment in which intelligent combi-vehicles dock and of which they actually form a part. (Thanks to the ability of the hybrid engine to convert to electric...
power, vehicles will be able to come indoors, they can hold their breath, so to say!)

* how eco-cycling (including regionally produced and transported food) can form positive links between town and country, for example, thanks to the new vehicles’ capacity to combine passenger and goods transports in frequent, interactive traffic, at least at periods of low traffic).

3. Initiate (parallel with the above) a UN-sanctioned programme of academic exchange in “North–South dialogue” between our institutions and corresponding institutions in the “South” on the problem of rising demands for mobility versus the need to reduce CO₂ emissions on a global basis. Start these projects now. Stimulate long-term industrial collaboration between “North” and “South” as ecologically sensitized students take their places in industry and policy-making bodies. Consider the likelihood that “North” and “South” will have to reach agreement on their traffic systems (i.e. the number of combustion engines in operation) in the span of the next decade or two!

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