

# Housing and mobility: indivisibility and paradigm shift

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## Introduction

Most European countries have a very well developed understanding of housing policies and priorities and separately of transport policies and priorities. This understanding is reflected in a large literature on sustainable housing (Bere, 2013, Edwards, P, 2000) and sustainable transport (Cervero et al, 2017, Bleijenberg, 2017, Kenworthy and Schiller, 2017) but there is a lack of understanding of the ways in which these two dimensions are deeply connected and, more importantly, of the ways in which outcomes and impacts in both areas can be improved and made more effective if both are pursued simultaneously within an integrated framework in the same places at the same time. Both dimensions embrace a large swathe of human needs, wants and desires and access to high quality housing in attractive locations is dependent on transport systems in the same way that transport systems shape the changes in urban form, structure and density that determine transport choices. The history of transport system evolution in many European cities has influenced the shape and patterning of housing developments and vice-versa (Dyos and Aldcroft, 1969, Hall, 2014) but not in ways that deliver objective-led development. It is now accepted that ways have to be found of shaping housing and transport outcomes so that we can achieve widely supported objectives. These objectives have been expressed by Whitelegg (2015) as “three zeroes” and all three (zero carbon, zero air pollution and zero deaths and injuries in the road traffic environment) can be delivered by a totally integrated approach to housing and transport. They are less likely to be delivered if housing and transport policies and projects are characterised by “silo” thinking (Barton and Grant, 2013)

This essay will explore the underlying rationale for total integration (the breaking down of silos) and the ways it can be achieved. This will be done in 5 sections

- 1 Integration does exist already but only in a few locations and with no explicit recognition of the need to change the way we do things to make it normal and unexceptional
- 2 The Great Mindshift and the need for paradigm shift and new ways of thinking
- 3 Key messages: space efficiency, community life, public health and fiscal opportunity
- 4 The building blocks: the example of Vision Zero
- 5 Next steps: the living laboratory

## 1 Integration already exists in a few locations

There are some best practice examples of an integrated approach to housing and transport in Europe and these reveal some of the basic principles and components that inform a more general approach to delivering high quality sustainable housing and sustainable transport in the same locality and at the same time. The work of the Danish architect Jan Gehl (Gehl, 2010, Matan and Newman, 2016) is another source of best practice that integrates spatial planning, public realm and green space. Whilst not explicitly embracing housing Gehl describes in great detail how cities can create high quality environments that provide an attractive setting for living, working and moving around.

Foletta and Field (2011) discuss 8 case studies and two of these (Vauban and Hammarby Sojstad) are discussed below together with Halton in Lancaster which is an innovative community, co-housing initiative.

Freiburg-im-Breisgau (Vauban) in southern Germany

Hammarby Sojstad, Stockholm

Lancaster, (Halton), UK

### **Freiburg-im-Breisgau (Vauban) in southern Germany**

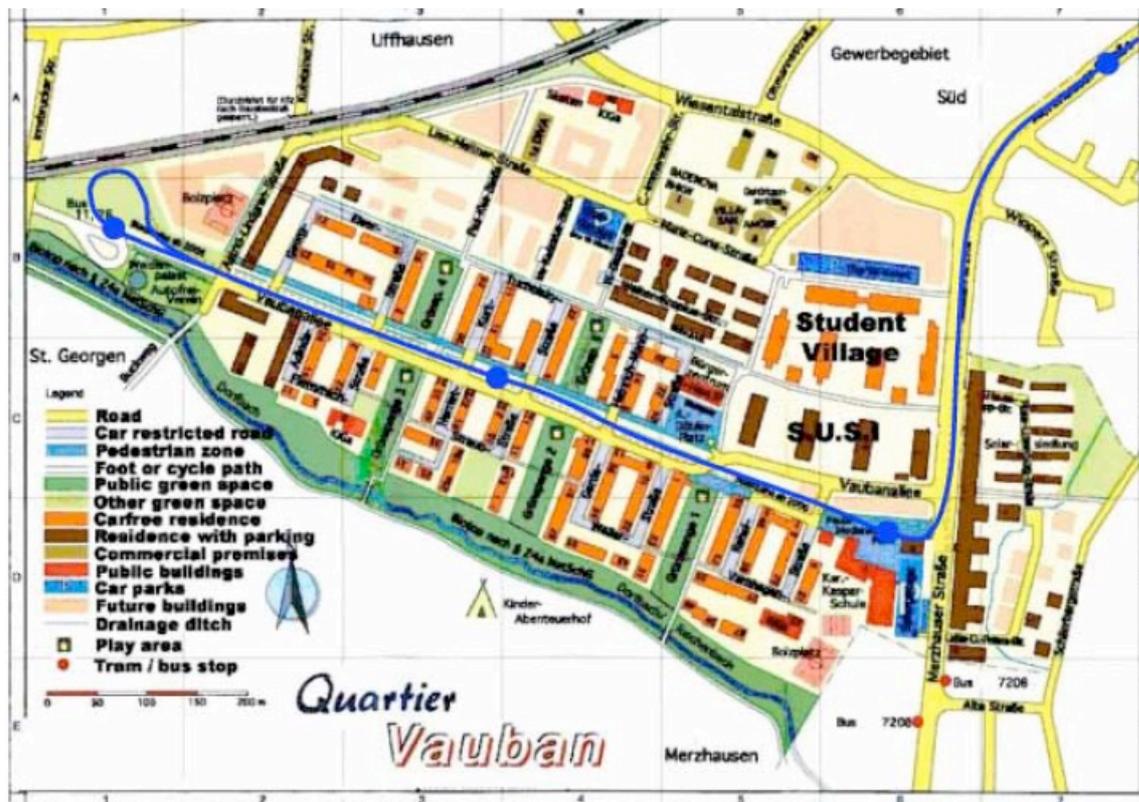
In Freiburg im Breisgau in southern Germany the street has been reclaimed for ordinary, everyday use by residents and all age groups. Freiburg has a very distinctive transport, new housing, public realm, spatial planning and green space policy that restore the role of the street in community life (Stadt Freiburg, 2010).

The elements that feed into a high quality living environment with streets for people are clear, effective and transferable and include:

- General 30kph/20mph speed limits on all residential roads. 90% of Freiburg's 240,000 residents live on streets that are limited to 30kph/20mph
- Cycling infrastructure and cycling promotion are high on the political agenda and have produced the environmental and safety/security conditions that encourage cycling with the result that 26% of all trips every day are by bike. The same can be said for walking with a 23% modal share. For the year 2020 Freiburg plans to increase cycling to 28% and walking 24% modal shares and produce a 20% share for public transport leaving 28% for the car
- The spatial planning policy is organised to maintain and intensify the compact city idea (Newman, 1992). The city resists attempts to expand the suburbs and blocks plans for out of town shopping centres and retail parks to maintain strong urban centre retailing and services and strong local shopping centres that can supply everyday needs.
- High quality public transport especially trams and buses that are fully integrated with both interchange and ticketing and integrated with the development of new car-reduced areas in Vauban and Rieselfeld. The number of trips by public transport pa in Freiburg has increased from 27.3 million in 1980 to 72.8 million in 2009
- Vauban and Rieselfeld. Vauban is a new residential area in Freiburg on the site of a former French barracks with a population of 5000 and Rieselfeld is a still expanding new residential area with 10,500 residents (Stadt Freiburg, 2010). Both areas are served by tram, both have exceptionally high energy efficient homes and photo voltaic installations and both are car-reduced in the sense that car free living is encouraged and "Aufenthaltsqualitaet in öffentlichen Raum" is a design principle that is actually implemented. The English



Figure 3 Map of Vauban



### Hammarby Sjöstad, Stockholm

Hammarby is a suburb of Stockholm, approximately 3 kms from the city centre. It is designed to a high standard of environmental, ecological and social performance across all housing and transport dimensions and has involved co-ordinated working across the whole of Stockholm City Council and private contractors. Its main characteristics are (Foletta and Field, 2011):

- A target of 11,000 residential apartments
- High quality energy efficient housing integrated with high quality public space and public transport and local facilities to influence behavioural change away from car use
- New public transport links
- An integrated masterplan (this eliminates silo thinking)
- Large amounts of green public space
- Re-use polluted ex-industrial land

In more detail:

- two new bus routes (innercity buses are fuelled by bio-gas)
- car sharing scheme (with 25 cars placed around the neighbourhood)
- a free ferry service (Stockholm is built on 14 islands)
- new tram line (which when complete will directly link to the centre of the city)
- ENVAC waste system (waste is collected via a network of underground pipes to central points for collection)
- many of the apartment blocks have solar panels or solar cells incorporated into their fabric

- sewage from the apartments is converted into heat energy and bio-gas for use in district heating plants and public transport vehicles
- solid waste resulting from the processing of sewage is composted and used in foresting
- apartments are linked to the city's district heating (which supplies 80 per cent of the houses in Stockholm) and district cooling is offered to offices and stores
- the road alongside the development has been lowered by two metres to reduce noise pollution
- linear green spaces thread through the masterplan connecting the housing with a nature reserve nearby, providing a habitat for local wildlife

Source:

<http://www.futurecommunities.net/case-studies/hammarby-sjostad-stockholm-sweden-1995-2015>

Figures 4-6 illustrate some of the key characteristics of Hammarby Sjöstad

*Figure 4 General view*



*Figure 5 Street scene in Hammarby*

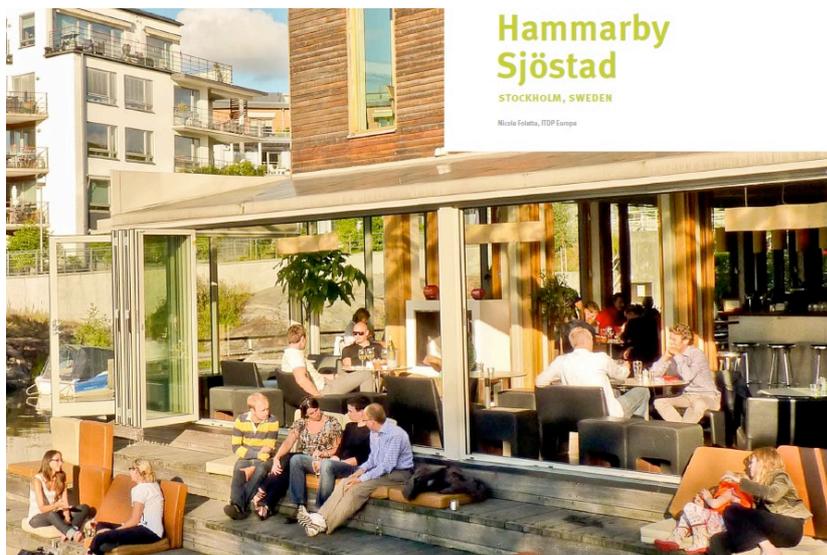


Figure 6 Typical housing in Hammarby



## Halton, Lancaster, UK

### The Lancaster Co-housing (LCH) project

Both Vauban and Hammarby are very large developments of several thousand homes within a carefully co-ordinated programme led by public bodies (city administrations) embracing energy, ecology, housing, transport and green space. This model works but there is a very different model that also works. Halton in Lancaster in the north of England is a co-housing project designed and delivered by a group of citizens with a very clear idea about integration and co-ordination, based on long-established principles of self-help. The citizens themselves have taken responsibility for the whole process which includes concept, design, the importance of reducing greenhouse gas emissions, the importance of high energy efficient homes (Passiv Haus), the importance of reducing car dependency and the importance of nature, beauty and quality of life.

The site can be seen on google maps, unlabelled at the end of Mill Lane, and the cycle path (in green on the other side of the river):

<https://www.google.co.uk/maps/@54.0757524,-2.75437,17z>

The LCH project is described as follows and is based on total integration of housing and transport dimensions:

Our multi award winning **eco cohousing community** at Forgebank consists of **private homes, community facilities, workshops/offices/studios** and shared outdoor space. We are around 65 adults and 15 children. We eat some meals together, make our decisions by consensus, and enjoy meeting our neighbours in our lovely pedestrianised street and Common House. Our cosy and comfortable homes meet Passivhaus and Code for Sustainable Homes (level 6) standards, and we benefit from renewable technologies (solar, biomass and hydroelectricity). Living at Forgebank

also enables us to live a lower impact lifestyle in many ways e.g. through our travel plan and car club, cooperative food store, shared meals and other shared resources.

<http://www.lancastercohousing.org.uk/>

Co-housing is a world-wide movement with many projects in Denmark, the USA and Germany. The Agora project in Darmstadt in Germany is another best practice example of citizen design and implementation and can be seen on

<http://www.wohnprojekte-darmstadt.de/wohnprojekte/agora/>

The importance of Halton and the Agora project lies in the potential of motivated groups of citizens to “get on and do it”. The importance from a public policy point of view is for national, regional and city governments to steer the taxation, planning and funding system in this direction so that thousands of citizen groups in every country can design and deliver 10s of thousands co-housing projects and demonstrate the high quality and desirability of totally integrated housing and transport outcomes.

Figures 7-11 illustrate some of the key characteristics of Halton

*Figure 7 A street in the Halton co-housing project*



*Figure 8 The riverside path from the scheme to the main urban centre of Lancaster*



*Figure 9 A street scene at the Halton co-housing project*



*Figure 10 A view of the project from the opposite bank of the River Lune*



*Figure 11 A group of residents*



## **2 The Great Mindshift and the need for paradigm shift and new ways of thinking**

The examples of high quality housing, transport, green space and public realm described above demonstrate that there is a lot of knowledge, design experience and delivery that we can actually see, visit and discuss with citizens living there. The problem that has to be addressed is that these examples are a very small part of the picture. Hundreds and thousands of new homes are built on greenfield sites every year with no (or very little) attention to the design principles to be found in Vauban, Hammarby or Halton. Housing developments in the UK do not adopt Passive haus energy efficiency standards and do not embrace sustainable transport and mobility consideration. They are provided with generous parking and with no thought at all about how the new residents will move around. They do not come with a clear vision about transport choices and why it might be desirable to build into the project from the outset the features that will encourage the use of bicycles, walking, buses or trams. They do not come with design principles based on accessibility. Will there be facilities within walking and cycling distance? Will these include shops for the purchase of everyday necessities? Will they include a kindergarten, primary school or health care facilities? Will they include social and community facilities?

The core problem raised by these considerations is the paradigm (Whitelegg, 2015). A paradigm is a deeply established set of often unstated beliefs and assumptions about how the world works and what is normal and what can be justified within existing financial and regulatory frameworks. The paradigm will vary in emphasis and intensity around Europe so that in German or Danish city there will be more attention to energy efficiency, green space, landscape and mobility than in Liverpool or Manchester but the paradigm is still present and reduces the chances of widely adopted projects like Vauban or Hammarby.

Whitelegg (2015) explores the mobility paradigm in some detail and the ways in which this supports higher levels of car use, a decline in walking and cycling, and a reduction in accessibility. The current mobility paradigm creates the right conditions for more car use and a decline in the use of alternatives to the car. Illich (1974) captured this process perfectly when he described how car use makes it possible for citizens to access the things they need to visit but makes it more difficult for the non-car owners to make contact. Car use supports spatial dispersion to increase distances between things and those who do not have a car or choose not to drive are increasingly isolated and unable to function. Housing is part of this socially unjust process in that the lack of integrated housing and transport planning encourages suburbanisation and large housing developments many kilometres from shops, jobs, education and health facilities. This can be seen at the extreme end of the spectrum in an Australian city e.g. the extensive suburbs of western Sydney which have created an accessibility deficit and a huge financial burden for low income residents who now live up to 40kms from the facilities they need to contact (Dodson and Sipe, 2008). The result of non-existent integration of housing and transport is that low-income groups have longer distances to travel, poor quality accessibility and above average expenditure on transport. The poor are disproportionately punished.

Whitelegg (2015) has shown that the current mobility paradigm is unfair, socially damaging, damaging to public health and expensive but more importantly has shown that like many other paradigms in history it can be overthrown and replaced by something much better and much kinder to people. Mobility and the choices we all have to make are shaped by rather obvious space and time parameters e.g. the location of housing and whether or not a new development like Vauban will have a tram route to connect the residents in about 10 minutes to a thriving city centre (Freiburg). This leads to the rather obvious conclusion that overthrowing the current mobility paradigm requires a great deal of new thinking about the location of new housing and the infrastructure that will give the residents high quality access to the things they need to access and a design that does not embed the car as the default option for transport choices.

Luckily none of this is difficult. There are many alternatives to the high mobility-poor accessibility world currently on offer. The starting point is promoting accessibility as a complete replacement for mobility (Schafer and Sclar, 1980). This is a paradigm shift that is now underway and accelerating. Like all paradigms, shift it is made more likely by a variety of different approaches, analyses and challenge. These include architecture (Gehl, 2010), social commentary and analysis (Illich, 1974 and Honore, 2005) and in politics (Sachs, 1993). The alternatives to mobility do not simply reduce or eliminate the negative consequences of year-on-year increases in mobility. They change the whole political, economic and social system so that it is kinder, more supportive of community life and values people far more than it values the ability to move around a lot in a vehicle. The essence of this fundamental shift in societal perspective has been concentrated by Sachs (1993) into “the 4 Lessens”, described as a “new pathway for good living”

- In time: less speed, meaning more slowly and more reliably
- In space: less distance, meaning closer and clearer
- In the material world: less clutter meaning simpler and fewer
- In the economy: less market, meaning providing and making for oneself

This is the essence of the much needed and now overdue paradigm shift and it is already embracing housing and transport. Accessibility is a core component of the new paradigm and this means shifting the whole process of housing design and delivery into a totally integrated housing and transport way of thinking. Accessibility cannot be improved unless housing policies are shaped in the same way and at the same time as mobility policies.

The mobility paradigm should be deleted and replaced by an accessibility paradigm that guarantees high quality walking, cycling, public transport and public health for all income groups, social groups and geographies. The accessibility paradigm requires a shift in thinking and willing, a shift in budgets and a strong social justice impulse that is lacking in most countries. It would produce more destinations that can be easily accessed by more people than a mobility paradigm. It recognises that distance is not a consumer commodity that we should set about increasing year-on-year and that the amount of distance we consume has no bearing on quality of life, satisfaction, happiness, community viability or health. We can all live much more satisfying and productive lives in supportive communities at lower levels of distances consumed and this is the objective of deleting mobility (i.e. more distance travelled) and replacing it with accessibility (many more things can be reached at a lower time, financial and environmental cost).

## **Paradigm Change is Transformational Change**

The task that now has to be completed is a total transformation of the mobility paradigm through an integrated approach to housing, transport and health care. It will be replaced by something much more intelligent, healthier and with strong social justice, climate change and quality of life dimensions. Fortunately there are precedents for a transformational change approach (Goepel, 2016)

The introduction to Goepel's 2016 book "The Great Mindshift" by Simon Dalby applies the transformational principle to the whole climate change debate. The climate change problem that most of us globally are now trying to deal with is the result of false assumptions and misleading objectives:

"Applying economic reasoning premised on scarcity, shortage and the need to massively increase human energy use ..is a major conceptual and political error. Hence the need for a fundamental transformation of policy discourses and of their intellectual underpinning in modern assumptions and modes of thinking. A "mindshift" is very obviously needed"

The "major conceptual and political errors" conclusion applies in full to the ways housing and mobility have been dealt with in European administrations and markets in the decades following WW2. It is, of course, also part of the ways in which we can deal with climate change. A zero carbon transport system (Whitelegg et al, 2010) is a rather obvious if poorly understood contribution to dealing with greenhouse gas reduction objectives and in combination with the high quality energy efficiency already noted in Vauban and Hammarby has a great deal to offer if we are to stand any chance at all of avoiding the predicted consequences of damaging climate change.

The same point has been made by Professor Uwe Schneidewind of the Wuppertal Institute in Germany, again in the introduction to Gopel's book:

"Recognising the urgency and magnitude of this challenge, the German Advisory Council on Global Change (WBGU) argues in its 2011 flagship report that we need a "Great Transformation". Referring to Karl Polanyi's work, it creates a realistic vision for the 21<sup>st</sup> century of a good life for 9 billion people within planetary boundaries, that is, if we manage to accomplish a great transformation"

Housing and transport are part of this "great transformation" and in the next two sections I attempt the difficult task of setting out the practical steps we can take to accelerate the process of transformation.

### **3 Key messages: space efficiency, community life, public health and fiscal opportunity**

Paradigm shift embracing the “great mindshift” will not happen as a result of professional, practitioner or academic demands that it should happen. The evidence from a comparable paradigm shift, the “Energiewende” or energy transformation in Germany is encouraging (Whitelegg, 2015). The chances of it happening increase over time in a cumulative accretion of best practice examples, simple logic, links to other policies (co-benefits) and sustained attention to the detailed arguments and justifications over time.

Interestingly a major paradigm shift is already underway in Germany (Lechtenboehmer and Samadi, 2013) and has more than a passing relevance to mobility. The conceptual links between energy policy and transport policy are strong. Both have been dominated for decades by an unquestioned assumption that more is good and should be supported by heavy investment in new infrastructure. In the case of electricity generation this meant more power stations should be built and in the case of transport more roads, airports and high speed rail must be built. In both cases the subject of demand management was often talked about but not rigorously implemented. In both cases it was recognised that there are sound arguments for reducing the need to travel and reducing the amount of electricity used but this did not alter the fundamental trajectory of more is better.

In energy the paradigm has clearly shifted and in transport it has not. It is now quite normal to talk about energy efficiency in the home, workplace and other buildings and thereby find ways to reduce consumption. This is also associated with a strong policy emphasis on renewable energy to shift the mode of production from fossil-fuel rich and dangerous technologies (e.g. nuclear) to zero-carbon and benign technologies e.g. wind, wave and solar. In transport none of this shift has occurred. Politicians and other decision-takers have learned the language of demand management and the many advantages that flow from increasing the use of walking, cycling and public transport but the dominant paradigm is still about economic growth and the need for additional infrastructure that promotes the maximum consumption of time (speed) and space (distance).

Germany has now taken the energy debate to the stage of a fundamental paradigm shift (Lechtenboehmer and Samadi, 2013):

- Renewable energy will fully replace nuclear power by 2050.
- 8 nuclear power stations were ordered to shut down 3 days after Fukushima.
- The remaining 17 nuclear stations will close by 2022.
- Germany will not need to import electricity and can phase out 100% of fossil fuel generation.
- There will be reductions in demand to assist this transformation.
- The loss of nuclear power will be more than compensated for by more renewables, reduced net exports and reduced demand.
- CO<sub>2</sub> from German power stations will be 50% lower in 2020 compared to 1990.

The “Energiewende” has been summarised by Graubner (2013):

“In a nutshell, it describes the country's politically supervised shift in direction from nuclear and fossil fuels to renewable sources of energy. This idea of a changing power path helps explain the literal translation: “energy turn.” The government says this transition will reduce security hazards and ensure Germany creates a greater share of its own power in future.”

All of these changes in the German energy system map perfectly onto what is possible in the housing and transport system.

In this section I will identify 4 examples of the detailed arguments and clear logic that support the case for paradigm shift in housing and transport. The key to accelerating paradigm shift is the frequent deployment of these arguments so that they become part of the DNA of decision-taking and collectively trigger the fundamental paradigm shift. They are:

- Space efficiency
- Community vitality
- Public Health
- Fiscal Responsibility

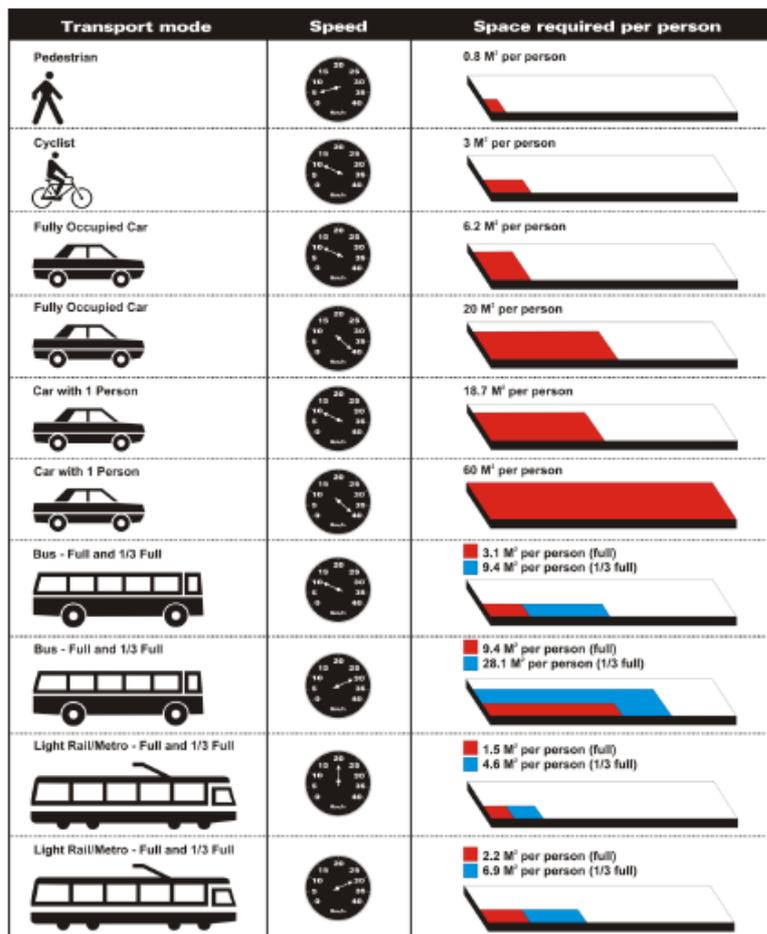
These are dealt with in more detail in Whitelegg (2015) and are briefly summarised here

### Space efficiency

Space (land) is a very valuable, finite commodity. In cities its value (price) rises dramatically and yet in transport and housing we routinely make sub-optimal decisions about how we design and implement projects and in the majority of cases we choose space inefficient paths e.g. low density housing with generous parking and transport strategies that promote car use (new roads and car parking) when walking, cycling and public transport offer huge gains in space efficiency.

This is illustrated in Figure 12

Figure 12 Space efficiency (Whitelegg 2015)

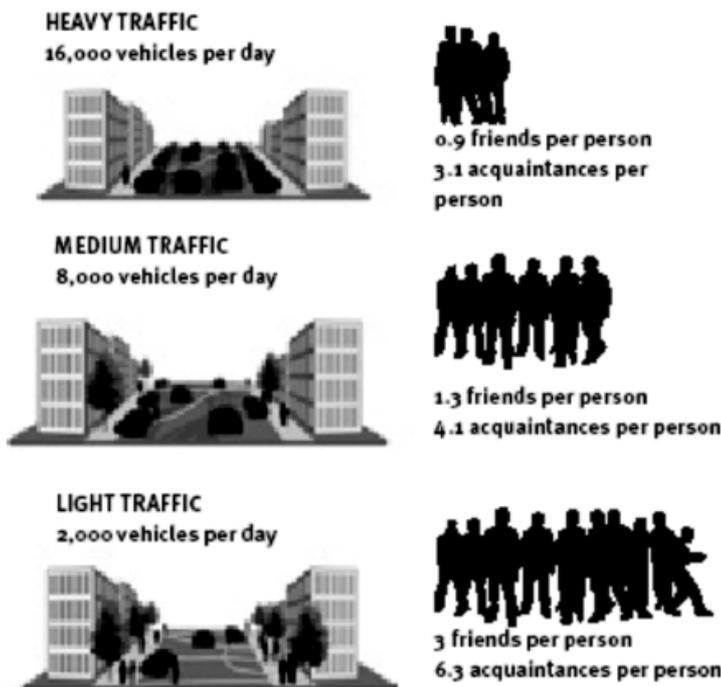


It is quite clear in the above diagram that it is both inefficient and illogical to proceed with housing and transport plans and strategies based on the need to allocate 60sq meters for a mode of transport (1 person in a car) when we can accommodate a large percentage of trips (e.g. Freiburg) allocating 3 sq metres or less (bike and trams).

### Community Vitality

We have been aware for over 4 decades that the number of motorised vehicles on a residential street has a profound impact on community life, neighbourliness, quality of life and social interaction (Appleyard, 1972). As traffic volumes go up so the use of the street by people goes down and social isolation increases and walking and cycling decline. Appleyard's work has been replicated in Bristol (Hart and Parkhurst, 2011) and in Christchurch, New Zealand (Wiki et al, 2018) and its findings have been confirmed. The lack of integration of these basic findings into spatial planning, housing, public realm and green space design and transport policies and strategies is a major public policy failure and an indication of a paradigm (cars first/people last) that is ripe for overthrow. The classic Appleyard diagram is shown in Figure 13

Figure 13 Traffic impacts on community vitality (Appleyard, 1972)



It is clear in the above diagram that we can choose to design streets and housing with high quality social, community and neighbourly outcomes so why would we want to produce dirty, noisy, unpleasant and socially disrupted outcomes?

**Public Health**

The lack of community vitality and social interaction is a public health problem but the current paradigm (cars first/people last) has strongly negative effects on public health in more direct ways including death and injury on residential streets, obesity.

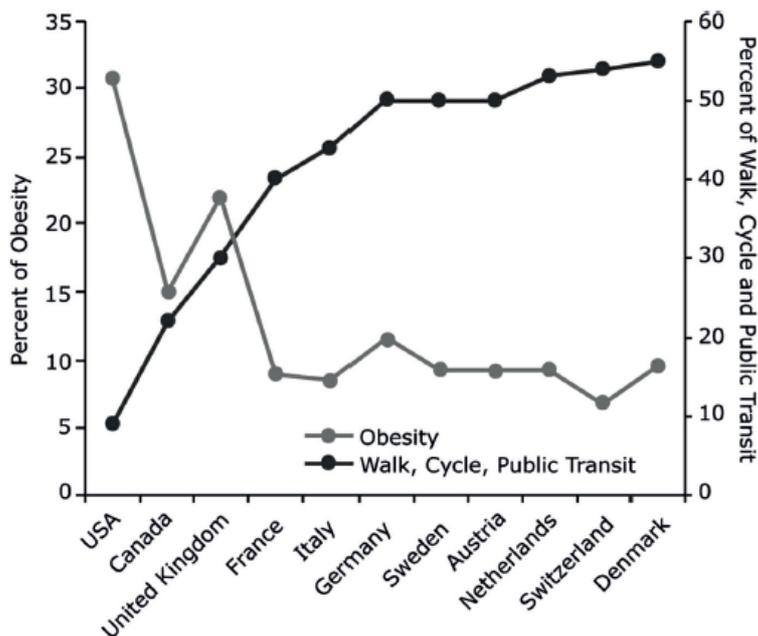
The death and injury problem is severe and requires a shift to much lower speeds encouraged and enforced by social media and cultural change. The fundamental relationship is revealed in Figure 14

Figure 14 Speed and the chances of survival when a pedestrian is hit at different speed



There is also a direct link between “active travel” and the population levels of obesity (Figure 15)

Figure 15 Relationship between active travel and obesity, Pucher (2011)



Air pollution also ranks as a very serious public health problem and one that requires a paradigm shift (large reductions in vehicles) as part of the solution. The scale of the problem is huge (Figure 16)

Figure 16 Air Pollution mortality in EU-28

430,000 deaths in EU-28



On the more positive aspects of what we can discuss to encourage a paradigm shift is the remarkable public health story associated with cycling (Figure 17)

Figure 17 Health benefits of cycling

**Cycling is Healthy**

*Cycling & Health*  
What's the evidence?

cycling england Nick Cavill & Dr Adrian Diarte  
public health evidence report

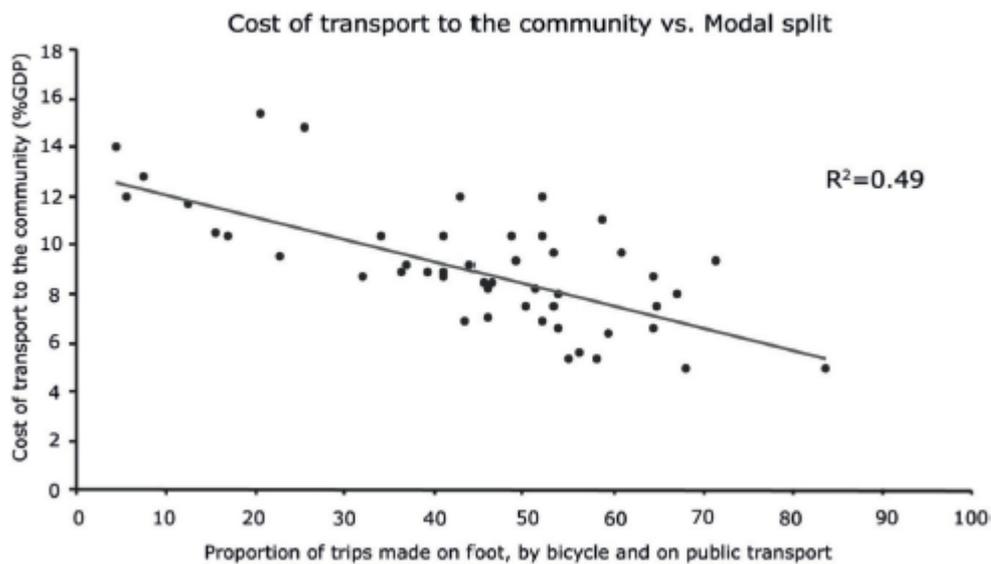
- 40% reduction in risk of death
- 2-3 years longer life
- 10 years fitter
- One death per 33m km
- Benefits outweigh costs

### Fiscal Responsibility

Cities with low levels of walking and cycling and/or low density of population are much more expensive to run (public and private expenditure) than cities with high levels of active travel (Vivier, 2006).

This can be seen graphically in Figure 18

Figure 18 The relationship between percentage modal split for walking cycling and public transport and the total cost of transport for the community as a percentage of GDP (Vivier, 2006)



## **4 The building blocks: the example of Vision Zero**

The 4 key messages discussed above are intended to prepare the ground for a paradigm shift. They will alert professionals and politicians to new ways of thinking about the details of what they are designing and delivering and at the same time require a greater degree of integration than is currently the case. This is not yet the same as paradigm shift but it stimulates more creative and lateral ways of thinking that make the shift itself more likely.

At the same time as the discussion and debates begin to embrace integration, space, public health and fiscal possibilities it will be necessary to put forward specific policy proposals that will add to the likelihood of paradigm shift. The Swedish "Vision Zero" road safety policy is an example of taking a traditional "silo" policy area and moving it into a wider systems and social context that requires integration.

In October 1997 the Swedish Parliament adopted its "Vision Zero" road safety policy. This policy sets a target of zero deaths and zero serious injuries in the road traffic environment and puts the responsibility for achieving this goal on all those responsible for the total road safety system. This means that the detailed design of the road, the vehicle and driving behaviour must be tackled as a "total system" so that "a mistake in the road traffic environment does not carry the death penalty". The Swedish approach is an ethical and civilised response to the unacceptability of death and serious injury on the roads.

Vision Zero sets a clear ethical tone to the road safety policy discussion. We do not have to accept death and injury as inevitable even if the number is lower than it could be. We do not have to think of the victim as in some way responsible e.g. he/she should not have been walking along the road or should have been wearing a high-visibility jacket. We do have to think about the ability of the human frame to absorb kinetic energy and adjust speeds accordingly. We can and should have a total 30kph speed limit on every residential road. We can and should change the culture of driving so that high speeds become as unacceptable as drink driving. We can and should enforce the speed limits but as much by cultural change and social marketing as by traditional policing.

### **What would a Vision Zero city or region look like?**

The key policy interventions include:

- Speed control (30kph/20mph in all urban areas and on all roads when those roads approach or leave towns and villages)
- Blood alcohol limit set at the Swedish level (0.02%).
- A zero tolerance policy for drug taking and driving
- Accident investigation agency modelled on the Swedish experience and independent of the police
- Law reform to deal with citizen concern about severe outcomes being dealt with "leniently" and a judicial system that respects those affected by death and injury and learns lessons from individual incidents and makes recommendations for changing those aspects of total design that are not working as well as they should
- Road traffic reduction

- Urban design to deliver clear road traffic danger reduction danger reduction for vulnerable users
- All new housing developments to be designed as part of Vision Zero. Why would we wish to create new housing areas that impose a higher risk of death and injury on those who live there than we can achieve at 30ph/20mph?

The key message in Vision Zero is that all these things must be done in ways that every measure and intervention supports every other measure and intervention. It is important to harvest the power of synergy where everything works in the same direction and where an overall ethical, zero tolerance approach takes root in every part of the system.

Sweden's Vision Zero policy has been in place for 21 years and has had a transformational effect on the way road traffic danger and total design is tackled. It energises every component of the system and stimulates a year-on-year improvement in the ways the total system operates. Figure 19 shows the Swedish record for road traffic deaths compared to other countries

Figure 19 Comparative road traffic deaths



Vision Zero has now been adopted in over 30 US cities including Boston, New York and Los Angeles and by the Mayor of London and the cities of Manchester, Liverpool and Edinburgh.

This transformational effect, like the German “Energiewende” discussed earlier, demonstrates that we can embrace integration, synergy and new ways of thinking in a very dramatic way to influence real world outcomes and this can now be applied to housing and transport. Other transformational proposals are already under discussion and are providing even more confidence that paradigm shift is getting nearer. Of particular relevance to housing and transport are car-free city concepts and totally free public transport. The latter is already in place in Tallinn and under discussion in Paris.

## **5 Next steps: the living laboratory**

In Elberfeld in Wuppertal in Germany, researchers at the Wuppertal Institute for Climate Energy and Environment have formed a partnership with the city authorities, residents and community groups to take an existing inner city area and apply the transformational concept in a real world case study. The transformation is described as “Car-free Elberfeld” with an emphasis on creating high quality streets and living spaces (Wuppertal Institute, 2017). This is a real-world project to explore how transformation can actually take place in an existing high density housing area and create a high quality living environment for all residents that deliver tranquillity, clean air and low carbon living and at the same time promotes a vibrant local economy. This is the “living laboratory” approach that marks a change in thinking on the part of academic research and public policy to deliver change on the ground. This is a paradigm shift and it is being monitored in detail and will be communicated in detail as a practical contribution to synergy and the integration of living environments, housing, transport and high level national policies to reduce greenhouse gas emissions.

The Living Laboratory approach is described in some detail with reference to examples in Germany, Denmark, the Netherlands and Sweden in Keyson et al (2017).

## **6 Conclusion**

A paradigm shift that will deliver integration and synergy in the closely interrelated policy areas of housing and transport is both desirable and essential. It will not be possible to deliver high quality outcomes in these areas without paradigm shift. The co-benefits associated with this shift are very significant indeed and include a much improved chance of dealing with climate change, an increase in health outcomes in areas classified as non-communicable diseases (obesity, diabetes and cardiovascular disease), huge increases in quality of life associated with streets for people and homes that are energy efficient and do not impose huge financial burdens on those in low income groups and mobility options that discriminate in favour of low income groups (walking, cycling and public transport). All of these co-benefits are amplified by a central concern for accessibility. Homes and mobility options will be designed and delivered to produce much improved accessibility and accessibility means that many more destinations (health care, jobs, education) can be reached within small time windows at low cost by high quality alternatives to the car.

The case for a paradigm shift is robust. We have the best practice examples (section 1). We have the evidence that shift can be accelerated (section 2). We have the logic, arguments and evidence (section 3). We have a knowledge base that specific policies are transformational (section 4) and we have the opportunity to harvest the potential of living laboratories (section 5). Action is now required.

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