SF 72: The targeted combination of different modes of transport

Fr	B	C	NY	S	T	Total
9	8	7,5	2	2,5	2,5	31,5

Beispiel:
With well-developed bike trails, its own car-sharing scheme and a well-developed network of bus and rail transport, **Berlin** has created all the prerequisites for a multi-modal transport system. The deliberate combination of the modes of transport on offer has already been identified by the population as an efficient and more cost-effective mobility alternative to private cars. This means that for every 1,000 inhabitants there are only 359.6 cars, well below the national average of 541 cars per 1,000 inhabitants.
Berlin recognised early on that a mix of different forms of mobility and their interlinkage offered much greater potential than concentrating on only one sustainable mode of transport, such as the bicycle.

1. Differentiated description of the key field

Multimodal transport is understood to be the specific combination of at least two different modes of transport to transport people or goods. The aim is to form integrated transport chains by linking up the various means of transport, taking advantage of the specific advantages offered by each mode of transport.

Under the aspect of environmental sustainability, suprarегional and regional rail transport should take top priority. Within cities, multimodal transport consists – in descending order according to ecological significance – of the following main means of transport:
- Walking
- Cycling
- Local public transport
- car-sharing
- Private conventional vehicles.

There is also a wealth of other means of transport, such as motorcycles and scooters, freight bicycles, shared bikes, electric bikes, pedelecs, small electric vehicles, electric cars, etc.

The ideal combination and weighting of the different modes of transport varies according to the general conditions and individual needs of a city.

To promote the willingness of citizens to switch, there are a number of successful measures, such as
- the establishment of so-called mobility hubs, i.e. well-developed nodes of two or more modes of transport
- the introduction of standardised tickets or payment cards, which passengers can use to take advantage of all forms of mobility offered by each city without incurring any additional expense
- the introduction of a planning tool in the form of an app or website that coordinates the arrival and departure times of various forms of transport, thus minimizing waiting times
- Increasing the number of stations or stops. In Singapore, for example, the maximum distance between each household and the next station or stop of the transport network is 400 metres.

In **Freiburg,** the subject of intermodality is already state of the art and has been put into action for decades. The links between modes of transport are improving all the time; the transition points are not yet ideal, but gradual improvements are being seen. Two major measures support intermodality: the RegioCard introduced 20 years ago and (partly copied from the Copenhagen model) well-maintained bike paths, cycle parking options and other bicycle concepts.

Berlin also has a well-developed bicycle network and is in the process of developing intermodal concepts further.

In **Copenhagen**, there are many approaches to intermodal concepts. Bicycles are well integrated through a well-developed infrastructure, and the chance to carry them on public forms of transport is well integrated into the overall traffic.

In the future, there will be more integration of electric vehicles as a further component of intermodal transport.

The conceptual development and implementation of intermodality is not being promoted so much in New York. The reason for this is the density of buildings, which is a limiting factor, e.g. when it comes to extending the cycle path network. The city is well served with underground trains, taxis and ferries and is well connected to inter-regional traffic by means of inter-regional buses and trains.

In **Singapore,** integrated, efficient and comfortable mobility is an important pillar of urban development. Integral planning has been carried out here for a long time already, so the public transport stops or stations are also only at most 400 m away from each household. The city would like to make increased use of the bicycle as an environmental friendly means of transport, but the tropical climate is one factor that limits this.

Tokyo has a good public transport network with 30 different bus routes that are well linked with each other. Convenient door-to-door mobility is a key field here, if only because, due to high structural density and the many residents, there is little space for private cars. In the future, transport connections to the suburbs will play an increasingly important role for senior citizens in particular.

2. Reference to sustainability:

Due to the various options to define building standards, specific or even comprehensive sustainability issues can be addressed. The tightening of energy requirements leads to lower energy consumption and hence lower emissions. Exemplary planning, implementation and documentation may motivate more developers to build energy-efficient houses. However, the proportion of new buildings is quite low in many cities. Each new (additional) building basically increases the energy consumption of buildings in the city. The aim should be to reduce the increase in energy consumption as far as possible. With the existing legal requirements in most countries, more stringent requirements result in a relatively small savings potential.

The focus in most cities is, therefore, on the energy-efficient refurbishment of the existing building stock. Some cities also have increased standards for the buildings it owns.

From an economic perspective, lower energy consumption leads to reduced energy costs, which, however, are offset by increased investment costs for the improved building envelope or technical building equipment.

Experience shows that there is only a small risk that the more stringent requirements will not result in lower energy consumption, especially with good planning, a solution tailored to the building and taking user behaviour into consideration. Low-energy buildings, etc. are tested over many years and only with very new (innovative) technologies, incorrect planning or different user behaviour is there a risk of substantially different energy consumption.

Social aspects of sustainability can, for example, be taken into consideration by means of appropriate standards relating to security in the event of a disaster (earthquake, etc.). The obligation to set up specific protection zones in buildings that are located close to the junctions of public mobility (underground station, train station, etc.) and to train the users of the building creates trust and an appropriate sense of security in the city should an emergency occur.

3. Relevance to industrial sectors?

Mobility:	Medium
Energy:	High
Production & logistics:	Medium
Security:	Medium
ICT:	Medium
Water infrastructure:	Medium
Buildings:	High
Governance:	High

Brief description of the high level of importance:

The requirements for the more stringent building standards are established by the city administration and passed, for example, by the city council (governance). If the desired result is less energy consumption, the key field has strong significance for the energy sector. Other requirements may affect the security or water. Basically, however, it is the building sector that is affected.

In the case of positive-energy houses, there is a link to e-mobility, since the energy surplus generated by the house is partly used by electric cars.

4. Impact (positive & negative)

Positive:
- Energy saved and emissions reduced
- Savings in energy costs
- Appreciation of the value of the building
- Integrated planning - learning curve for the various planning teams

Negative:
- Higher investment costs that can be recouped through savings in energy costs
- Greater planning effort
- Greater need for coordination, e.g. in an integral planning team

5. Implementation measures:

When developing the more stringent requirements, studies are commissioned from research facilities or universities to estimate the financial impact of different levels of tighter requirements and to calculate the average amortization periods. The studies and requirements drawn up are then presented to and adopted by the decision-making body (e.g. city council) or have to be revised.

The standards may need to be defined, tested and anchored in law.

The putting into practice of the specifications can be supported by appropriate energy managers or other energy consultants.

For building standards which have voluntarily been made more stringent, the standard has to be defined and disseminated. Where certification is desired, planning and implementation must be reviewed.

6. Actors: Who can shape things?

The urban requirements can be designed by the city administration or by the institute it commissions studies from.

Building standards that have voluntarily been made more

stringent are launched either by the federal state (improved financing conditions) or by private organizations for the purpose of certification after inspection in exchange for money (e.g. Passive House Institute) and are then dependent on their successful dissemination.

2. Reference to sustainability:

Economic and ecological
The deliberate combination of different modes of transport results in the city enjoying more efficient urban public transport. This is an important prerequisite for competitiveness and the gradual reduction of motorized private transport. With shorter journey times and more convenience when planning a trip, it is possible to influence the mobility behaviour of the general population so that citizens switch to public transport, which makes more economic and ecological sense. In the process, both the pollutant and noise emissions of motorized individual vehicles, as well as the high volume of traffic and the resulting congestion in the city are done away with. Besides the environmental benefits of public mass transit, the high investment costs for the mobility infrastructure that will initially be incurred can be amortized by intensive use.

Social
Positive effects on the growing social alienation that can be observed in major cities are likely, since citizens will be able to encounter each other more often while going about their daily business and thus maintain contacts. This can also be supported and extended given the right structural conditions of the means of transport and stops/stations.

Risk if ignored:
With rising urbanisation rates and thus increasing motorized private transport, many cities are experiencing traffic chaos; densely populated cities are even threatened with gridlock. Air quality and noise will worsen. Cities without well-developed public transport systems and good intermodal connections are already becoming less attractive.

3. Relevance to industrial sectors?

Mobility:	High
Energy:	Medium
Production & logistics:	Medium
Security:	Medium
ICT:	High
Water infrastructure:	None
Buildings:	None
Governance:	Low

Brief description of the high level of importance:
The merging of the different modes of transport networks and the city's central coordination of its mobility systems are of very high importance to the local populations' mobility. The goal is to make all trips within the city more efficient and more convenient by public transport, as has been the case with private cars to date.

Integrating all public transport networks, cycle and pedestrian paths into an overall concept requires a huge effort, which is only possible through IT-based programmes. ICT applications can quickly calculate the best route. In this case, the passenger can exclude forms of transport or limit the number of times he or she has to change from one means of transport to another. This makes it possible to tailor a journey to the individual needs, thus also facilitating the shift away from motorized transport.

4. Impact (positive & negative):

Positive
- More mobility due to less traffic
- Increased mobility comfort for citizens possible (no traffic jams, shorter journey times, work while travelling, etc.)
- Higher quality of urban life, especially through cutting harmful emissions and fewer areas full of parked cars
- Easier to do without a car
- Greater flexibility and lower costs for users
- New business models possible

But
- Great change in mobility behaviour required
- Associated with high investment costs

Negative
- May or may not be accompanied by lower sales in the auto industry

5. Implementation measures:

Many prerequisites for multimodal transport are already given in most cases, such as infrastructure in the form of railway networks, cycle paths, footpaths, or bus lines.

This must, in part, be developed further, and the most important measures for successful multimodal transport include the deliberate combination of existing ones. The various modes of transport have to be integrated into an overall concept. Such a concept could include the following measures:
- Prioritisation of modes of transport
- Focusing on extending transport infrastructure
- Provision of, for example, transport nodal points
- Coordination of individual modes of transport (timing and arrival times) through planning tools
- Mobility apps and standard mobility tickets for easy use
- The actual implementation measures and the deliberate interlinkage of different modes of transport exist
- etc.

7. Prerequisites:

Intermodal transport makes sense primarily in densely populated areas such as cities. It is aided by an already good range of public transport means and/or good cycle paths and footpaths.

8. Obstacles/barriers:

- Lobby of automobile manufacturers
- Lack of understanding among the population
- Responsibilities and priority ranking unclear
- Many actors must cooperate with each other (e.g. regarding tariffs, etc.)

9. Indicators:

What information must be collected to identify the key field in a city? If necessary, establish a reference to the existing City of the Future indicators

- Is there one single standard ticket for all a city's mobility options?
- Is there is an application (app, website, etc.) for planning multimodal trips?
- How many transport nodal points are there where at least two different forms of transport intersect?

10. Special features/remarks: