The Impact of Institutional Structures on Transport Infrastructure Performance. A Cross-National Comparison on Various Indicators

W. Martin De Jong
Faculty of Technology, Policy and Management
Delft University of Technology
Delft
The Netherlands
E-mail: w.m.dejong@tbm.tudelft.nl

EJTIR, **1**, no. 2 (2001), pp. 169 - 196

Received: January 2001
Accepted: July 2001

It is generally acknowledged that structures and styles of decision-making have an important impact on what transport networks under these regimes look like. However, this has not been a regular line of research up to now. This paper investigates this by distinguishing four types of institutional structures that reflect various politico-administrative systems and styles in Western Europe. It seeks to construe an argument on how these types of institutional structures have divergent impacts on 1) decision-making speed on infrastructure projects, 2) satisfaction of actors in the decision making process, 3) Benefit-Cost ratios for projects, 4) modal split, 5) size of transport networks, 6) congestion in the networks and 7) investment levels. It seeks to explain why every specific type of institutional structure has a specific predicted impact on the form, type and performance of the transport networks and also takes into account that institutional structure is not the only factor with an impact on final physical outcomes. The article gives a well-substantiated argument on the supposed connection and provides some empirical evidence, but does not claim statistical significance. It sets a first step toward a new line of research and suggests this may prove fruitful as a contribution to policy making.

1. Introduction

It is generally acknowledged that structures and styles of decision making have an important impact on what transport networks under these regimes look like. Some seminal publications, such as those by Salomon, Bovy & Orfeuil (1993), Banister (1994), Gerondeau (1997), Cervero (1998) and Bertolini & Spit (1998) put transport networks explicitly in the

context of their wider spatial and governmental, organisational and bureaucratic environments. In Cervero's Transit metropolis, for instance, the evolution of towns and cities friendly to public transport networks in the various nations is clearly dependent on underlying administrative processes and various settlement patterns which at their turn also hinge on spatial regulatory regimes. Additionally, the possibility to limit and hamper car use in certain areas and under certain conditions and the willingness of people to accept living in relatively dense areas clearly has some cultural overtones. Denizens of Singapore and Stockholm are more respectful of their government's rule than are inhabitants of Mexico City and Toronto and therefore create different opportunities for regulatory measures. Gerondeau shows how difficult it is to harmonise road safety policies across Europe, because of different values attached to safety, different ways in which inspection by governmental agencies is organised and different education systems existing in the various countries. Once again, the administrative dimension turns out to be a crucial factor for the how and why of the development of transport policies as well as their eventual performance.

Despite this wealth of empirical evidence systematic surveys of the influence of institutional structures on transport infrastructure development and performance has not been done. In itself, this is less surprising than it seems, for infrastructure performance is dependent on a whole range of factors of which decision-making structures is just one of the options and clearly not the simplest one. Divergent geographical patterns, levels of welfare, varying consumer preferences or still other factors have attracted more attention for the explanation of national differences. Furthermore, the trouble is that all these factors are so much entangled that for most of the above mentioned authors solid individual case studies were a more achievable or desirable aim than methodologically tricky cross-national comparisons. And they clearly led to deepened insights.

Comparisons between the various institutional structures and their effects are also very promising, however. It is a novel research area that might offer a number of opportunities for improving the decision-making context for the development of public transport. It is based on knowledge how various types of institutional structures lead policy actors to set different priorities and lead to varying levels of investment and accommodation of transport demand. Obviously, any evaluation that is made of a country, more in particular the performance of its infrastructure, will depend heavily on the enshrined norms - which are themselves subject to wide-ranging prioritisation. Quality is far from being an unambiguous term (Beckford 1998). Thus, whereas technicians are generally inclined to base evaluations on traffic standards, economists look first at cost-benefit ratios or expenditure levels and public officials focus more on acceptance of embraced policies by their constituencies or at the speed with which policies are implemented. As a consequence, these analysts may have preferences for different institutional structures.

In this article, a first attempt is made to see how four types of institutional structures distinguished by the author impact on infrastructure performance. To do justice to various types of analysts and their disciplinary preferences, section 4 highlights three criteria for process quality in decision-making on infrastructures, namely speed, satisfaction of involved actors and use of cost-benefit ratios. Section 5 deals with four criteria for product quality (functioning of the infrastructure network itself, being the modal split, the size of the network, network congestion and expenditure levels). With regard to the latter criterion, more infrastructure and increased expenditure are not necessarily more desirable than less infrastructure and lower spending. The relationship between process and product is often

very subtle. The former European Centre of Infrastructural Studies (ECIS) made a wise statement when it remarked that:

> Much of Europe's infrastructure, in practice, is driven by the inertia of ministerial and local budgets, with variations caused by budget considerations (and electoral cycles) rather than by a careful assessment of needs. General under investment may pose a less serious problem than misallocation. Indeed, overcapacity may co-exist with serious bottlenecks (ECIS 1996: 27).

In the long run it is the relationship between process and product and between the diverse indicators that provides us with a reliable and realistic picture including both spatial, economic, transport and political arguments. Simplifying complex material would merely have an adverse effect here.
If we relate these outcomes to the countries' institutional positions, we will gain a deeper understanding of the relationship between decision-making structures and how certain structural and persistent traffic problems may be caused. To get there, first in section 2 a typology of institutional structures will be developed, after which section 3 gives some predictions on how the four respective types are expected to affect the process scores in section 4 and product scores in section 5. Section 6 presents some concluding remarks.

2. Four types of institutional structures

In the political-administrative process of policy-making, analytical information, data and arguments are used by policy-actors in a political way. As a result, the way in which this information is reworked, transformed and implemented into physical products such as transport networks depends heavily on how the administrative rules of the game lead actors to employ this information to their own benefit. For example, when one party is able, through its strong position, to monopolise most of the investment funds and is in the position to set the agenda for the debate, the variety of information used to come to political problem solving will be much more restricted than when several actors need each other and start setting up co-operative structures to both generate and share information. Also, when due to a lack of co-operative incentives, information and results gleaned from evaluation models are not shared, collaboration between parties is drastically complicated and (semi-)public goods as comprehensive, vast and vulnerable as public transport may suffer.
In previous work (De Jong 1999), four dimensions relevant for infrastructure planning have been distinguished, being federalism, democracy, integralism and corporatism. They were applied to six Western countries (Switzerland, Germany, the Netherlands, England, the United States and France) and their scores on each of the dimensions were established on the basis of field research.

The dimensions were defined as outlined below:

1. Federalism - unitarism, expressed in terms of the federalism index (FED). A country is considered more federal when the institutional structure gives more support to the organisation of veto powers for lower government tiers against proposals emanating from the state, and to more frequent taking of initiative at lower levels (intergovernmental veto powers).
2. Democracy - technocracy, expressed in terms of the democracy index (DEM). A country is considered to be more democratic when the institutional structure gives more support to the organisation of veto powers for social groups (pressure groups and individual citizens) against proposals emanating from government or scientific experts (societal veto powers).

High scores on these two dimensions reflect high levels of checks and balances in the institutional structure and therefore a much more even distribution of power among actors.

1. Integralism - reductionism, expressed in terms of the integralism index (INT). A country is considered to be more integralist when the institutional structure gives more support to consideration of all possible aspects and implications of infrastructure investments during the appraisal process (conceptual co-operation).
2. Corporatism - pluralism, expressed in terms of the corporatism index (COR). A country is considered to be more corporatist when the institutional structure gives more support to the development of feelings of loyalty between actors after the achievement of agreement between them, thus reducing the tendency to the taking of opportunistic stances (political co-operation).

High scores on both of these latter two dimensions reflect stronger incentives for co-operation thereby increasing levels of information exchange and the realisation of co-productions with various parties contributing to projects. In the previously mentioned study, a variety of data on a set of variables was collected for the countries mentioned in table 1. The final country scores on each of these four aspects, based on an extensive analysis of these data, are presented in table 1.

Table 1. Country scores in the four institutional dimensions

Dimension Country	Federalism (checks and balances)	Democracy (checks and balances)	Integralism (incentives for collaboration)	Corporatism (incentives for collaboration)
Switzerland	MID	HIGH	HIGH	HIGH
Germany	MID	MID	HIGH	HIGH
Netherlands	LOW	MID	MID	MID
England	LOW	LOW	LOW	LOW
United States	HIGH	HIGH	LOW	LOW
France	MID	LOW	MID	MID

For more details, backgrounds and extensive comments, see De Jong (1999).

When taking the levels of (1) checks and balances reflected in the first two dimensions and (2) incentives for collaboration as the key aspects to determine how institutional structures guide the use of information, the following table of institutional structures can be presented:

Table 2. Four types of institutional structures

Key aspects as to the use of information	Many checks and balances	Monopoloid power structure
Incentives for co-operation	Type 1. Co-operative interactors	Type 2. Benevolent dictators
Incentives or competition	Type 3. Individualist competitors	Type 4. Hierarchical determinators

Type 1. Co-operative interactors
The institutional system has a wide range of interdependent actors, who also maintain durable relationships. It demands a combination of varied creation of information and extensive sharing of it. Both checks and balances and co-operative structures have been realised, leading to a high degree of conceptual harmonisation over time between actors. This limits the extent to which actors ´blind one another with science´ during the evaluation process, since they can acquire clear insight in each other's calculation methods. The standardisation, acceptance and wide applicability of the models allows them to be used repeatedly without the need for continual redesign or modification to deal with new cases.

Type 2. Benevolent dictators
The institutional system comprises relatively few actors monopolising most the resources, who do maintain lasting relationships among themselves. As a market form, this structure resembles an oligopoly with strong cartel formation. Information comes from only a small number of sources, but it is widely shared. Actors have co-operative inclinations, but power is not really evenly spread among them.

Type 3. Individualist competitors
The institutional system comprises a very wide range of actors, who maintain only volatile relations between themselves. As a market form this structure resembles a market with a relatively large number of players on the supply and demand sides, who do not succeed in reaching collusion or agreement because these are mainly focused on direct individual utility. There is a lot of individual innovation, but this innovation is only standardised after the event or not at all. There are a great many checks and balances, but co-operative structures among the actors are missing.

Type 4. Hierarchical determinators
The institutional system has a relatively small number of different actors of which one or two dominate the debate. Moreover, these actors maintain few relationships. A dominant market leader sets the agenda and tries to impose it on the other actors without need or willingness to listen to any of them. He/she is focused on direct utility and speed of decision making.

Comparing tables 1 and 2 lead us to conclude that Switzerland and Germany come closest to approaching institutional structure type 1, the United States to type 3 and England to type 4. The positions of France and the Netherlands are slightly more complicated because they cross each other when it comes to federalism and democracy. French citizens and pressure groups are relatively less powerful, but lower tiers of government can bar central government decisions better through a system of osmosis and double functions. The Netherlands has

more provisions for citizens to speak out their opinions, but provinces and municipalities hardly have any funds when it comes to transport investments. France and the Netherlands, each other's mirror images, are improbable candidates for a type 1 or type 3 position, but both could swing to be types 2 or 4, depending on the circumstances. We will come to that later.

3. Predictions for infrastructure performance

Institutional structures influence the way in which financial priorities are set. These effects of this prioritisation can be subsequently recognised in the way the transport network has been constructed and how it functions. One way of providing the dimensions in the institutional approach developed in this report with explanatory or predictive power is by relating the institutional structure and aspects of infrastructure in various countries. In other words, how are infrastructures influenced by institutional structures? While making this connection some important nuances will have to be kept in mind:

1. Although we assume a connection between institutional structure and characteristics of the infrastructure network, this is not a direct causal relationship. The spatial structure of countries or regions may represent an especially disturbing variable. Large, sparsely populated areas suffer less from congestion than small, densely populated areas, but need more money to 'cover' the territory. Furthermore, geological circumstances differ, so that in some places construction is substantially more expensive. This is, for instance, the case in mountainous Switzerland. The TNO-INRO studies (1995, 1996) comparing the Randstad, the Ruhr Area and the Flemish city triangle reveal that many differences in quality and capacity of infrastructure networks are explained by spatial characteristics. Geographical settlement patterns make a particular network structure more obvious than another. Also, a connection exists between the spatial concentration/fragmentation and the administrative concentration/fragmentation, as indicated by the NEI (1991).
2. The materialisation of decision-making in physical works takes time. This means that the characteristics of the infrastructure network may date from institutional structures of some time ago. In order to demonstrate the effect of institutions on physical production, we ought to compare the institutional structure of decades ago with the current infrastructure. Such research is not feasible for practical and methodical reasons.

However, institutions often share a highly sustainable character. Although elements may change over time, the main structure is often the same since it is the manifestation of secular, deeply rooted thought and action patterns. Dobbin (1994) has studied institutional structures as they existed when railroads came into being in the 19th century. He concludes that remarkable continuity exists in the way countries tackle policy problems. Much of what was common in the 19th century is still relevant. In this light we then should regard his following remark:

> During the nineteenth century nation-states developed institutions for organizing economic life that paralleled those they used for organizing political life. (...) When nations face new policy dilemmas they design new institutions around the principles of existing institutions. (...) I will argue that policy approaches are reproduced because

> state institutions provide principles of causality that policy-makers apply to new problems, and not simply because institutions give policy-makers the organizational resources that repeat history (Dobbin, 1994: 2-3).

His message, translated to institutional structures for prioritising infrastructure, is that administrators and designers of structures automatically adopt a familiar line of thought, that they apply time and again to other issues. This study focuses on uncovering the underlying design logic of each country as much as possible. This enhances our understanding of how countries operate when developing institutional structures, with the intention of displaying strong and weak sides. In his comparative analysis of institutional structures for planning of railroad projects in 19th century England, America and France, Dobbin arrives at some conclusions that are remarkably close to those in this study. The following quotes are remarkable in showing how railway investment policies in three different countries show a high degree of continuity over the centuries:

> Why do nations pursue such different industrial policy strategies today? The United States enforces market competition and eschews state leadership in virtually every state industry. Meanwhile, French state technocrats orchestrate sectoral growth from above, and Britain bolsters firms against interference from both markets and state officials. (…) Americans aimed to create a private system of railroads using public inducements. The French aimed to create a public system of railroads with the help of private capital. Britain's early financial policies were genuinely laissez faire: the state did nothing to promote or regulate private finance (1994: 1, 58).

England was characterised by a practice in which enterprises and subnational governments were governed from a distance by central government, without London making real contact or interfering in their processes. The individual enterprise had to be protected against government intervention, as well as against the whims of the market. America was more inclined toward public-private partnerships in which all contributed some and no one was fully in control. They were aimed at inter-organisational networks in which 'community self-rule' and the voice of citizens and representative local governments were given important roles. Technical expertise of individuals was not trusted. The political idea of power distribution in the American Constitution was maintained and considered relevant to the economic reality of railroad construction. The French considered harmonisation and standardisation of railroads the most important goal and this could only be left to technocrats from central government (*Corps des Ponts et Chaussées*). Private capital could only be used for execution matters[1].

[1] Dunlavy (1992), after studying railway policy in 19th century America and Prussia, nuances the statement that assessment practices can be directly deduced from institutional structures. Based on current practice, one would expect in 19th century Germany that public bodies and public enterprises also financed and organised investments in infrastructure. That, however, is not true. Up to the middle of the 19th century, German states left railroad infrastructure largely to the private sector. Normally, the state would have initiated it and while it did have that ambition, Prussia was still a monarchy where the king decided about the construction of railroads. Waterways and roads were 'done' by the state, so that there was little money left for railroads. Had there been enough money, as in Belgium, railroads would have been constructed by the state. For lack of resources it was left to private investors who did not accept state intervention. In that time, higher taxes were only conceivable as a consequence of political liberalisation. It was not until the 1840s - after much public pressure - that state loans were agreed to finance railroads and the existing private railroad companies were

3.1 Types of institutional structures and performance

The hypothesis that various types of institutional structures will result in various types of infrastructure networks requires a properly substantiated argument:

Type 1: Co-operative interactors
In these structures, substantial alterations of central proposals can be suggested given the large number of administrative and societal veto powers. The variation in ideas is increased. For the parties involved in the assessment process, there are strong incentives to co-operate. So the variation of information is largely adopted.
Due to the extensive number of checks and balances between actors, speed is predicted to be low; time to reach agreement and acceptance is taken into consideration from the very beginning. Due to actors' co-operative inclinations the duration is relatively predictable. A positive side effect is high level of satisfaction among participating actors however. When it comes to the question which aspects are seen as important in appraisal frameworks, all actors will have had some influence and various criteria, aspects or arguments have been incorporated.
Type 1 structures leave room for all transport modes and integrate them well both internally and externally; co-production between modes frequently occurs. Given the large number of veto powers, experts' projects and programmes are processed quickly and without too many changes. As a consequence, the constructed infrastructure meets societal demand. The large amount of expenditure is not spent on a large numbers of projects but on adequate incorporation in the physical environment.

Type 2: Benevolent dictators
In these structures proposals by the centre can hardly be changed given the limited number of administrative and societal veto powers. The creation of variation of ideas is therefore limited. For the parties involved in the assessment process, strong stimuli exist to co-operate so that this limited variation is adopted by all.
Due to the limited number of checks and balances between actors, speed is predicted to be high; not much time is needed to reach agreement, because resistance can be expected to be weak. This has its repercussions on actor satisfaction however; it is predicted to be low. When it comes to the question which aspects are seen as important in appraisal frameworks, it is the dominant (national) actor that has by far the most impact; national economic growth and financial viability will probably prevail over other aspects.
Type 2 structures provide room for all transport modes and integrate them well internally, but not intermodally with other modes and are otherwise not very innovative either. Given the limited number of veto powers, experts' projects and programmes can be executed relatively quickly and intact. As a result, the amount of constructed infrastructure is more than adequate, but it is used inefficiently. The large amount of expenditure is not spent on environmental aspects, but rather on a large number of projects.

---

nationalised. The enlargement of the power of the *Länder* vis-a-vis the national government was established under the influence of the allied forces after the Second World War. Contrary to England, America and France, Germany has experienced major changes in its state and administrative system since the last century. This limits the possibilities for recognising continuity in the past 150 years.

Type 3: Individualist competitors
Serious alterations in central proposals can be made in these structures given the large number of administrative and societal veto powers. This enhances the variation of ideas. Parties involved in the assessment process have no incentives or minimal incentives to co-operate, As a result, the great amount of variation is only partially adopted by some actors. Harmonisation of evaluation models is uncommon.
Due to the extensive number of checks and balances between actors and their competitive inclinations, speed is predicted to be low, and rather unpredictable; (semi-) public goods are only realised if all required actors see the project as relevant to their interests. A positive side effect is a high level of satisfaction among participating actors, however. When it comes to the question which aspects are seen as important in appraisal frameworks, all contributing actors will have had some influence and various criteria, aspects or arguments have been incorporated. Nevertheless, these are dealt with in a rather ad hoc and unsystematic manner.
Type 3 structures leave little room for transport modes that cannot maintain themselves in a competitive environment, but when they can, they are both efficient and innovative. Links are created only if they serve the players' direct interests. Given the large number of veto powers, experts' projects and programmes are rarely processed quickly or left intact. As a consequence, the infrastructure constructed meets societal demand. The small amount of financial means is spent on a large number of small projects, which have something attractive in it for all actors.

Type 4: Hierarchical determinators
In these structures changes in central proposals can only be proposed to a limited degree given the limited number of administrative and societal veto powers. The variation of ideas is therefore limited. There are minimal incentives for the parties involved to co-operate so the limited variation is adopted to a small degree and only because the weaker parties cannot withdraw from the monopolist´s financial power.
Due to the limited number of checks and balances between actors, speed is predicted to be high; not much time is needed to reach agreement, because resistance can be expected to be weak. This has its repercussions on actor satisfaction however; it is predicted to be low. When it comes to the question which aspects are seen as important in appraisal frameworks, it is the dominant (national) actor that has by far the most impact; national economic growth and financial viability will probably prevail over other aspects.
Type 4 structures leave little room for transport modes that cannot compete and stimulate efficiency. These structures do not encourage innovation in these modes. Given the limited number of veto powers, the lack of a central will for investment is not compensated by the strength of other actors. As a consequence insufficient infrastructure is constructed, and societal demand is not accommodated. The small amount of financial resources is used for a small number of centrally selected large projects.
The tables 3a and 3b summarise the characterisations of the various structures:

Table 3a. Types of institutional structures and process performance

Type of institutional structure	Speed of decision making	Actor satisfaction	Benefit/Cost ratio
Type 1 Germany and Switzerland	Low but predictable	High	Lots of relevant criteria and aspects taken into account
Type 2 France (to some extent)	Fast and predictable	Average	Financial and macro-economic issues
Type 3 USA	Low and predictable	Average	Mainly financial and easily tangible issues
Type 4 England and the Netherlands (to some extent)	High but unpredictable	Low	Mainly financial and easily tangible issues

Table 3b. Types of institutional structures and product performance

Type of institutional structure	Modal split	Size of the networks	Congestion in the networks	Size of investments
Type 1 Germany and Switzerland	Much distribution across modes; much interconnection between modes	Strict accommodation	Temperate congestion	High expenditure on many smaller projects (quality construction)
Type 2 France (to some extent)	Much distribution across modes; minimal interconnection between modes	Large capacity	Minimal congestion	High expenditure on some large projects (quantity construction)
Type 3 USA	Little distribution across modes; much interconnection between modes	Strict accommodation	Temperate congestion	Low expenditure on many smaller projects (quality construction)
Type 4 England and the Netherlands (to some extent)	Little distribution across modes; minimal interconnection between modes	Little capacity	Much congestion	Low expenditure on some large projects (quantity construction)

The simplification from four dimensions to two key aspects does not result in loss of information for most countries (in fact four countries fall nicely in their places), except for the two mirror-images the Netherlands and France. The Netherlands and France differ so crucially on the federalism and democracy scores, that these have substantial effect on the functioning of the institutional structure and thus on the constructed infrastructure. As a result, the participation of societal groups is relative larger in the Netherlands while local governments are passive. In France, the reverse is the case. Since pressure groups and interested parties are often less supportive of extra infrastructure than governmental bodies, the pulling forces in favour of an increase in capacity will be stronger in France than in the Netherlands. Furthermore, this will be focused more on capacity expansion itself (quantity) than on spatial fit (quality). Since, for the other cases studied, the federalism and democracy scores on the one hand and the integralism and corporatism scores on the other hardly differ, a consolidation of these dimensions poses no complications. We expect France and the Netherlands to swing between types 2 and 4, but due to the fact that double functions in France create strong co-operative ties between politicians and administrators, we expect it to be more a type 2 and the Netherlands more of a type 4.

For the transport science indicators presented below, we used tables from transport studies of various national ministries, Kolpron, CBI, ECIS, TNO-INRO, the UN and from previous work done by this author (de Jong 1999). The hypotheses specified in this section will be tested using real-world observations in sections 4 and 5.Predictions made in this section and reality will be matched in sections 4 and 5.

4. Scores for process quality

In this section, the three performance criteria for process quality are briefly described after which some statistics are presented to see if they fit the expectations. The three process criteria are speed, satisfaction of involved actors and the relevant aspects used in cost-benefit analyses.

4.1 Speed of decision-making

In practice, the 'process time' is often an implicit criterion for assessing decision-making on infrastructure projects. When the speed of decision-making is the criterion, the will to act becomes the most important aspect. This means that ideas should not be changed too often since this would slow down the decision-making process. The line of reasoning here is that the benefits of infrastructure will occur more quickly and the costs will generally be lower when planning and construction proceed according to the plan. Also, a large number of practical, administrative problems are decreased such as low expenditure in some years and budget deficits in other years.
Quick decision-making may have a number of important disadvantages. Because of the emphasis on pushing certain decisions through, it is possible that the contractor has little or no consideration for arguments and contributions of opponents. These opponents could, under different conditions, well be potential participants who would enrich the final decision. While the costs will be higher, hopefully the long-term benefits will be greater, thus it might be wise to reconsider before one acts. Today's benefits may well be tomorrow's costs. The French planning specialist Merlin wrote about this:

> Lengthy and costly projects yield infrastructures with a life span of decades, generations or centuries It is understandable that decision-makers cannot afford to make mistakes in such circumstances; after all, their decisions are doubly important, because of the costs involved and because of the long-term consequences. (Merlin, 1994: 6, original in French, translation by the author).

Seen in this light efficient, but hasty decision-making (*efficiency in a narrow sense*) is unwise and substantial variation of ideas and a thorough selection from that variation is necessary. *Efficiency in the broader sense* means keeping an eye on the long term and being open to quality improvement. This requires attention for coincidence, treading unknown paths and thorough reflection on decisions before actions are taken. Such activities are never *efficient in a narrow sense*.
Decision-making speed is not easy to measure. The beginning and the end of a project are usually difficult to determine precisely, and decision-making speed may differ from the one

project or mode to the other. Decision-making speed, in reality, is often an impression instead of a precise measure.
Solid empirical research on the length of decision-making procedures is scarce. Using Kolpron's data (1994), we have made the following table of only European countries. We should realise that it concerns *estimates* made by national civil servants.

Table 4. Duration of the decision-making process in years (measured until 1990)

Transport mode	Switzerland	Germany	Netherlands	England	France
Roads	16	16	24	20	6
Railroads	12	15	9	5	7

Source: Kolpron 1994.

From these data we derive that the length of the decision-making process in type 1 structures (Germany and Switzerland) is long but predictable, and short in type 2 structures (France). Both outcomes are in accordance with the predictions in paragraph 3. No data are available on the USA. The duration of decision-making processes regarding roads in the Netherlands and England (type 4 countries) is substantially different from the expectations. These scores may be explained from the fact that in both countries, the Ministry of Transport is the dominant actor and while it can limit the constructive veto powers of other parties, it cannot eliminate their blocking power. Other actors besides the one who initiates a project apparently do not have the power to submit policy proposals and get them accepted, but they can prevent quick implementation and construction. That this undesirable effect occurs more with roads than with railroads can probably be explained by the fact that railroad owners are often the sole initiator, while for roads authority is more dispersed. Low federalism and democracy in combination with low integralism and corporatism do not lead simply to quick decision-making: it is likely that low federalism and democracy scores with an average or high integralism and corporatism scores are even better. In this case, weak parties are met with a willing attitude and receive some influence, which in turn prevents them from using all influence they have against the realisation of infrastructure projects.
In a recent publication, The Confederation of British Industry (CBI 1995) also attempted to present a careful indication of the process time in four countries (England, France, Germany and the Netherlands). According to CBI, the construction of infrastructure (in general) in the Netherlands takes 12 years from the moment that any certainty exists about the availability of national funds. For Germany, numbers of 9 years for railroad projects and 10 for federal highways are mentioned, but the politico-administrative discussion must be added to this. There are no periods indicated for France but it is assumed to be rather speedy. England takes as much as 13.5 years, basically for lack of a consensual attitude and financial resources. No matter how much these estimates differ from those offered by Kolpron, they do indicate that limited veto power and offensive, competitive relations certainly do no guarantee quick decision-making. Not even when the procedures appear to suggest so.
A third more detailed study deals with the developments and changes in the national railroad plans in Switzerland and the Netherlands in the 1988-1996 period under the influence of their respective institutional structures (De Jong, Stevens and Veeneman 1996). It appears that in 8 years time, the Swiss plans have gone through major changes under the influence of several veto powers (referendum, lump-sum financing, strong influence of cantons), while

Dutch Rail project realisation may have fallen behind schedule, it is still relatively fast and unchanged. After 8 years, only a third of the Dutch intentions has been realised and the money for the whole programme has been depleted, while in Switzerland the maximum amount available resulted in enormous cutbacks: the existing rail system can handle capacity with better and larger transport material. The Dutch are quicker and more technocratic than the Swiss. Because of a continuing budget for Dutch plans, national government and Dutch Rail have more room to grant detailed municipal wishes. In Switzerland, on the other hand, regional wishes have been anticipated from the start, but since they appear to take a secondary position as a result of cutback measures, a stalemate developed. According to this detailed study, a strong unitary and relatively technocratic country can operate far more quickly than a federal and democratic country. According to Moser (1993), the Swiss policy-makers have to deal with a great number of veto powers within a rather rigidly applied legal framework. Furthermore, money, which appeared to be excellent oil for massaging and quickening processes, was lacking for rail projects in Switzerland.
And finally, in its research of decision-making on large infrastructure projects in a number of areas in North Western Europe, the NEI (1991) presented several conclusions in tables (number and size of projects, solidity and time span). Up to a point, these are related to the institutional structures in a country. It is interesting to compare the outcomes of the NEI research with the outcomes we may expect in this investigation (see table 5):

- The number and size of projects are related to the ambition levels of actors. Oversupply often thrives in combination with low veto power (low federalism and low democracy) combined with strong tendencies to co-operate (high integralism and corporatism). Low federalism and democracy scores combined with low integralism and corporatism scores would result in a smaller number of projects (under-supply). Other combinations will not be so distinct since opposition or veto will mitigate high or low ambitions. Number and size of projects ought to be large in France and the Netherlands, not all too marked in Germany and low in England.
- The solidity of a project is supposed to score high in environments lacking opportunism and with many shared preferences. This requires high integralism and corporatism and is unrelated with federalism and democracy. Solidity of projects should be high in Germany, average in France and the Netherlands and low in England.
- The time span of projects is usually shortened by low federalism and democracy (‘will to act’) and low integralism and corporatism (‘winning’ instead of vetoing). The time span should be shortest in England, relatively short in France, longer in the Netherlands and longest in Germany.

Outcomes are not only influenced by institutional structures, but also by welfare, spatial structures, preferences of the population, the condition of the infrastructure, regional differences within countries and specific events. Therefore, interpretation of data such as these should always be done with great care.

Table 5. Characteristics of infrastructure projects in various areas

Regions	Infrastructure projects and correctness of hypothesis (yes/no)					
	Number and Size		Solidity		Duration in Time	
Hamburg	Fairly large	Yes	Fairly large	Yes	Fairly Long	Yes
Frankfurt	Limited	Yes	Reasonable	Yes	Long	Yes
Rhein-Ruhr	Reasonable	Yes	Reasonable	Yes	Rather long	Yes
Ile de France	Large	Yes	Large	No	Rather short	Yes
Greater London	Large	No	Limited	Yes	Rather long	No
Randstad	Large	Yes	Limited	Yes	Long	No

Source: NEI 1991.

The conclusions are:

1. All expectations for Germany (type 1) are correct.
2. The hypothesis that the solidity of projects in the Ile de France is average is not correct. The solidity is great. This is probably a consequence of the TGV effect; it takes longer for parties to find common ground, but once it is found, the high speed train is running.
3. The hypothesis that the number and size of projects in England is small, is wrong: the number and size are both large. We should add, however, that the greater London area is just about the only part of England where heavy investments are made. Almost all other areas receive very little.
4. The hypothesis that the time span of projects in England is short or very short is also wrong. It is rather long. There is no direct institutional explanation, other than perhaps there is no more money. The NEI reports on this: 'Also in Greater London the solidity of projects is limited, especially because of the reluctant attitude of government to financially participate in large projects.' (1991: 97)
   In light of the above, we should not be surprised.
5. The expectation that the time span in the Netherlands is average is not quite correct: it is rather long. Perhaps, we see a reversed TGV effect; it does not take long for parties to find common ground, but once they have it, they appear to have different agendas so that consensus is only cosmetic and the high speed train is slowly moving forward on existing track.

The most striking outcome of this evaluation of time and speed of infrastructure projects in various countries concerns the Netherlands and England. Given their scores on several institutional dimensions (low federalism and low democracy, low to average integralism and corporatism) a high speed would have been expected. This, however, was not the case. The best way to explain this is by means of the decentralisation paradox:

> *The decentralisation paradox*: the timely consultation of lower governments by the central government and the partial ‘giving away’ of influence may very well lead to wider support for negotiation results and a situation in which use of decentralised power instruments are put to use for central goals. Contrary to the expectation of many, enhanced steering opportunities for the central transport ministry arise instead of decreased opportunities. Centralisation of decision-making power would fuel maximum resistance from decentralised actors and minimum use of their policy instruments. This would result in major delays. In other words, low federalism is certainly not a guarantee for high speed: it requires skilful management. Both the

Netherlands and England can be characterised as countries where financial means are concentrated at the national level. As the capital assumes that he who pays also decides, the blocking power of spatial-juridical competences and organisation power of personnel tends to be systematically underestimated (De Bruijn, Ten Heuvelhof and De Jong 1994: 48).

4.2 Satisfaction of involved actors (satisfaction norm)

A norm that may result in diametrically opposed outcomes to the speed norm is the norm that all involved actors must be content at the end of the decision-making process - both with the way the process developed as well as with the outcomes (Teisman 1995). In material terms, this means that after consultation and negotiation, all interested parties who had something to offer in the decision-making process have reached agreement. In this case, one can assume they have 'learned'. The amount of time from beginning to end is only of secondary importance. Strict procedures often lead to forced or sub-optimal outcomes in which parties may have something to offer each other but are unable to do so given rigid procedures. In this context, the laissez-faire approach of decision-making provides sometimes interesting, surprising and promising outcomes.
No systematic survey research has been done on the satisfaction of actors regarding infrastructure projects, let alone international comparative research. But from case descriptions of the institutional structures and decision making in De Jong (1999) we can derive the following observations:

1. Germany and Switzerland (type 1), where both public bodies and societal groups are captured in the decision-making process, have a reasonable amount of satisfaction. This is not so much because they always get their way, but more because they have the feeling that all individuals have a legitimate place in the process. Involved actors are content. Non-involved actors are usually discontent, but there are not too many of those. Many checks and balances assure many involved actors, while high co-operation assures that they all are accommodated within reason.
2. France (type 2), where public bodies are especially contained, experiences little discontent within public channels. However, the discontent about process and outcome among pressure groups and citizens is much higher. Every new proposal to enhance participation bounces against a wall of distrust. The involved actors are content and powerful, the non-involved are not, but powerless.
3. In the United States (type 3), where the number of policy relevant actors is largest, there is no fundamental distinction between public and private actors. This is a consequence of the fact that actors are involved in some decisions and not in others. Sometimes they are capable of creating a coalition of parties with comparable interests, and these win sometimes and lose sometimes. The combination of strong checks and balances and fragmentation of assessment process does not lead to the kind of containment you would find in Germany or Switzerland. On the contrary, pragmatism and self-interest results in a practice of ad hoc associations between actors in which everybody will win sometime, without being able to predict exactly when. The course and outcome of decision-making is something like throwing dice. Few are thus always discontent because no actors consistently lose.

4. The Netherlands and England (type 4) share the philosophy that public bodies and societal groups deserve a place in the decision-making process, but they will have to fight for it. Furthermore, every type of co-operation is created ad hoc and is certainly not long term. No actor is really assured of his place. The number of actors that can really make a difference during the process is small. The national transport ministry is the major funder, and only the largest municipalities have good contacts with the capital and the seat of government; the representatives of the various transport modes are organised in tight monopolistic clubs, despite a privatisation philosophy. Smaller municipalities adopt a passive attitude and environmental lobbies are usually aggressive. Every now and then they win a battle, but co-deciding on the main course of a policy is outside their reach. This is not surprising for England, but it is for the Netherlands which has extensive participation procedures and open planning processes. The fundamental choices with respect to main ports and the major infrastructure are, however, made in a much smaller circle (Huigen, Frissen and Tops, 1993; Siddiqui 1996). Societal groups can do little more than stepping out of the discussion, declare their opposition, buy land and start judicial procedures. How open are the planning processes, really, when participation is seldom equal to decision? Some non-involved but interested actors are consistently dissatisfied.

4.3 Relevant aspects used in cost-benefit analyses

In essence, the substantive motive to develop infrastructures is almost always related to expected societal benefits divided by the costs to be incurred. As a corollary, institutional structures that result in infrastructure projects or traffic systems with a high B/C ratio are preferred above others. This is one of the few policy analytical norms posed and is, in that sense, more valuable than the others which are all process norms.

Unfortunately, in terms of outcome, this norm is also the least operative: benefits and costs of produced infrastructure systems are spread out over long periods of time. They are rarely - if ever - predictable and they are difficult to define. They are particularly difficult to define since some cultures value certain societal benefits more than others. Also, the importance attached to various items under both costs as well as benefits may differ from country to country. Furthermore, benefits can be positive as well as negative and some can be expressed in monetary terms while others cannot; thus the B/C ratio can never be captured in one single number. Last, but certainly not least, it is not easy to ascribe the benefits derived from traffic systems solely to the institutional structure that developed them. Other factors may be just as important.

It is possible to outline in general terms how costs and benefits are distributed per country. Thus, someone who focuses on the costs of infrastructure and who does not believe in a broader spectrum of externalities, will have a preference for results that are expressed primarily in monetary terms. Those with a focus on the supply vision upon infrastructure and an orientation on benefits, will prefer countries with substantial and nuanced multi-criteria matrices.

When applying this criterion, the best that can be achieved is an indication of how and where costs and benefits are distributed and which issues are considered costs and which are considered benefits. In the end, such an assessment is dominantly a matter of ideology. Thus, a focus on the costs of infrastructure will lead to little belief in the broader spectrum of externalities and will favour the Anglo-Saxon countries which do not include the less

measurable effects of infrastructure: only that which is directly visible is taken into account. A focus on the planning of traffic networks and a supply view on transport will result in the inclusion of all possible relevant aspects in their considerations. When we distinguish between production costs, transactions costs and benefits, we develop an insight in the stronger and weaker points of various countries:

Type 1: Germany and Switzerland
Advocates of a supply view on infrastructure and an orientation on benefits will prefer countries with high co-operation scores. Integralism promotes attention not only for business-economic but also macro-economic and various spatial and ecological interests when looking at traffic issues. Corporatism results in estimates of positive and negative externalities, as they are experienced by various parties. The line of reasoning is that since these effects in the production process are translated by actors to third parties, they ought to be internalised via collective action. While all of these *inefficient effects in a narrow sense* probably occur, but are difficult to assess, arbitrary choices are made with respect to their relative weight in the larger societal cost-benefit balance. Since a broad concept of benefits will raise the B/C ratio, the construction of infrastructure on policy analysis grounds is to be expected.
The broadest concept of societal benefits exists in Germany, where almost all business-economic, macro-economic, ecological, urbanistic and politically opportune effects have their place in the decision-making framework. The *Standardisierte Bewertung* is an institutionalised example of this. It is remarkable that the application is, time and again, very precise and that representatives of relevant organisations in the project team are involved in applying the method (TNO-INRO 1991, KUB & TNO-INRO 1997). The production and transaction costs are high, as are the benefits, especially in the spatial and ecological sphere. Switzerland also uses a very broad concept of infrastructure benefits, but the belief in integral policy analysis is traditionally smaller. The approach there is one of planning of the transport network by government and transport companies and a democratic test by the population who are expected to independently weigh their interests.
Therefore, the predictions fit the German case very well and the Swiss case to some extent. In Switzerland, there is no comprehensive framework for appraisal, but in all of the decision making process, transport investment projects are seen from various angles by various actors.

Type 2: France
France, on the other hand, focuses strongly on and values highly traffic and macro-economic benefits of infrastructure and less on spatial and ecological issues. This is especially visible in railroads that emphasise societal profits for investments, contrary to the partial multi-criteria approach in Germany. In France, most projects also have to meet some form of Cost Benefit analysis, but their contents are financial and macro-economic in nature and its use takes place in much more politicised environment. Criteria or wishes from pressure groups, lower tiers of government and citizens have very limited or no representation in these sophisticated models. The French case fits the predictions.

Type 3: United States
By coupling public and private forces, the situation in the US is less homogeneous and probably more favourable. Several governments encourage each other to develop creative financial constructions, so that the effects of lower expenditure on economic benefits are mitigated. The way non-economic benefits of infrastructure are taken into account varies a lot per state. Some states and Metropolitan Planning Organizations (for instance in California) have set up interactive processes inviting several participants to air their view and suggest criteria that were all incorporated in a general framework, others focus just on costs, financial viability and profitability.

Type 4: England and the Netherlands
Usually, economic criteria and relatively slender analyses of societal costs and benefits are sufficient for an assessment in England. This almost automatically means that the total benefits are low, costs are comparatively high and a high B/C ratio can hardly be established. In the end this results in lower costs (expenditure) on infrastructure, while the direct economic profit is satisfied. The lowering in England is mainly accredited to a lowering of production costs by simply decreasing production. England uses a set evaluation method (COBA), that translates all aspects in economic terms and does not consider user benefits. In that, the zero-alternative (doing nothing) is also taken into account, clearly a cost-reducing factor. The application of the method is evaluated by the national government without the involvement of sub-national actors, this also reduces transaction costs. Whether this decrease in transaction costs actually happens is less evident, given the length of decision-making and the difficulty in establishing agreement on research data and decisions.
Like other European countries, policy makers in the Netherlands believe in more than only financial criteria. The environment and the concentration of urban areas also require attention. Assessment methods exist, but their use is hardly systematic: they are only used when parties feel the need to do so[2]. As a result, the dissemination of the type of benefits depends on the type of project. The largest projects around main ports and distant connections are highly motivated by macro-economic arguments, while many investments in public transport are argued in terms of spatial and environmental benefits. Thus, constructed roads are justified for considerations of network completion. An absence of standardised assessment also results in production costs, transaction costs and benefits which are highly ad hoc by nature. In general, both types of costs are relatively low, but rising. Economic benefits appear reasonable, although traffic statistics do confirm the image of a country very sensitive to congestion. Much attention is given to planning issues, although these are not as systematically researched as the 'societal benefits', but more as instruments for political gain. Quite recently, a new evaluation procedure (OEEI) has been introduced in the Netherlands, which is actively supported by the current Minister of Transport and which is used to evaluate many recent projects. It was devised by mostly economic consultants and people working for the Ministry and lower tiers of government have mostly stayed outside this

[2] TNO-INRO (1991) concluded about the Dutch public transport situation that a rather large number of individual studies are conducted in order to get insight in aspects such as comfort, changes in the amount of passenger kilometres, travel time, travel time evaluation, costs of tickets, investment costs, exploitation costs, noise, use of space, environmental aspects, and safety. Since then an integral policy evaluation for collective transport has developed, but this has never been generally accepted or applied.

process. Only the future can tell whether this procedure will eventually institutionalise have real political impact. If it does, a decisive step in the English direction has been taken.
Predictions fit the English case extremely well, whereas the Dutch case remains elusive.
In sum, the three alternative approaches to process quality give diverging results. Speed points to France as the winner, while all others are rather slow. But an institutional designer wishing to take transplants from France has to remind himself that the accompanying losses in terms of democracy lead to a very high citizen dissatisfaction. Contentment among players is high in Germany and Switzerland. It is lower in the USA and the Netherlands and lowest in England. The expectations as such were almost all confirmed.

5. Scores for product quality

In this section, the three performance criteria for product quality are described shortly after which some statistics are presented to see if they fit the prediction. The three product criteria for transport infrastructure are modal split, size of the networks, congestion in the networks and size of the investments.

5.1 Modal split

The prediction with respect to the modal split is that in the United States (type 3) road dominates and intermodality is successful, that England and the Netherlands (type 4) concentrate their transport streams on roads while being not so good at intermodality, that France (type 2) leaves more space for other transport modes, but that intermodality has hard times there and that Germany and Switzerland (type 1) have a strong spread over various modes and are also good at intermodality.
The statistics in the table below confirm most of the expectations:

Table 6. Modal split passenger transport (in %, excluding biking and walking)

Country	Car	----------Public transport----------		
		Total	Rail	Other
Switzerland 1989	80.8	19.2	13.6	5.6
Germany 1991	84.0	16.0	6.6	9.4
Netherlands 1991	83.4	16.6	8.4	8.2
England 1991	87.8	12.2	5.7	6.5
USA 1992	97.8	2.2	1.3	0.9
France 1991	86.5	13.5	7.8	5.7

Sources: Dutch Ministry of Transport 1996, US Department of Transportation 1996.

The hypotheses turn out correct except for the modal split in the Netherlands, which is less car-dominated than expected. The fact that co-operation is not as low as in England can in part account for this. Other, mainly spatial reasons, will probably provide the other part.
For a comprehensive test of the predictions, a presentation of the modal split of the transport of goods would be required. Figures about these, however, are extremely complicated to generate, not suitable or simply not available (cf. Tavasszy 1996) for a number of reasons:

1. The transportation distance of cargo highly influences the modal split. The countries investigated vary in size, and this results in distortion of figures. Also, national transport, international transport and transit are often difficult to separate.
2. Neither the weight transported (tons) nor the weight transported multiplied by the number of kilometres (ton-kilometres) are adequate indicators for the importance of freight. Furthermore, the difference in outcome on both units is enormous. Switzerland, for instance, scores 10% for rail in tonnage and 41.8% in ton-kilometres. In other countries these figures are more comparable.
3. The presence of waterways is a disturbing variable for making expected connections since it requires minimal financial resources for construction and maintenance. A substantial part of freight in the Netherlands is by inland waterways. It is unclear to what mode this transport would be allocated in the absence of waterways. The number of waterways in Switzerland is negligible.
4. The measurement of modal split data is complicated. Many data are not registered or are only registered per individual transport company. National aggregate data are incomplete and inconsistent.

Nevertheless, on the basis of secondary sources, we can make the following remarks:

1. In all countries, road dominates in the modal split.
2. The share of inland waterways is very small in Switzerland. In terms of tonnage, rail is limited, but in terms of ton-kilometres it is about half.
3. In Germany, inland waterways and rail, in particular, are important, even though roads occupy the largest share. In the specific case of North-Rhine Westphalia, inland waterways are more important than rail.
4. The share of inland waterways is large in the Netherlands even though road transport remains largest in terms of tonnage. The share of rail in the modal split is less than in any other country.
5. In England, road dominates even more than in other countries and the share of inland waterways is negligible. Rail is used more frequently than in the Netherlands and less than in other countries.
6. The road is less dominant in the USA than in other countries. The use of inland waterways is limited but not negligible. Transport of goods by rail is important - greater than 40% in terms of ton-kilometres. The large distances in the USA, combined with liberalisation, have resulted in profitable railroad enterprises.
7. Inland waterways are not well developed in France, relatively unimportant and, in fact, declining in importance as well. The share of rail is smaller than in the Low and Germanic countries and larger than in England.

In light of the unequal availability of inland waterways, the freight transport statistics are about what we expected. The only striking conclusion is success of railroads in the USA. This may be explained from the fact that geographical circumstances and the integration of several modes into one integrated, intermodal transport enterprise resulted in a situation where freight by rail was profitable.
Intermodality can hardly be expressed in data; numbers of terminals are not very meaningful. Effects can be found more easily in how the transport modes interact. Thus, we can see that in Germany and Switzerland public transport companies increasingly use each others' rail

tracks and restore old tracks for new purposes. Also, the development of transfer-points and the co-ordination of service delivery are more advanced in the Germanic countries than elsewhere. These issues are under consideration in the Netherlands, and France largely develops the various types of public transport separately. Due to the almost complete lack of public transport in the USA, one can hardly speak of intermodality. In some areas, such as northern California and the East Coast, however, where collective transport is important, the independent public transport companies more frequently engage in co-productions in service delivery in order to improve the connections between their lines (Chisholm, 1989). In England the disintegration of and competition on the 'networks' is the biggest issue. Comparable conclusions can be drawn for freight. 'Intermodal hubs' in the USA are economically important. The first integrated intermodal transfer point in Europe was completed in Bremen. By now some 25 *Güterverkehrszentren* exist in Germany. Sea transport, rail, road and inland waterways are connected to these. Switzerland is not a country with large transfer-points, but the *Huckepackverkehr* (trucks on train) has developed enormously, more so than in France and Austria (Swiss Ministry of Transport 1992), though the legal restrictions to road transport play a role here. In the Netherlands, Rotterdam is completely intermodal and a policy is being pursued to develop other intermodal transfer points; this is in its starting phases. In France, and especially England, intermodal connections are still something for the future.

5.2 Size of the networks

The prediction with regard to the size of the networks is that England and the Netherlands (type 4) will have a limited capacity, France will tend to oversupply (type 2). In France, the emphasis is more on administrative fit (medium federalism, low democracy), which may lead to an over-investment in projects that are a valued by the technocratic elite and an under-investment in environmental issues. In the Netherlands, the attention is directed more toward societal fit (low federalism, medium democracy), which may result in an over-investment in fitting in projects with the surrounding space and under-investment in network capacity. In general, the capacity in France will therefore be large and in the Netherlands small. Middle positions are expected for the USA (type 3) and Germany and Switzerland (type 1). In Germany and Switzerland, rail capacity will be higher and road capacity lower, in the USA the opposite is the case.

Table 7a. Size of the infrastructure networks I (1993)

Country	Road length/ surface in km/ square km	Road length/ inhabitants in km/1000	Length rail net/ surface in km/ 100 square km	Length rail net/ inhabitants in km/100,000	Length waterways/ surface in km/ 1000 square km
Germany	1.8	7.9	11.5	49.8	1.2
Netherlands	3.1	6.9	8.1	18.1	12
England	1.6	6.7	6.8	28.5	0.4
France	1.7	15.9	5.9	56.6	0.4

Source: Dutch Ministry of Transport 1996.

Table 7b. Size of the infrastructure networks II (1988)

Country	Length rail net in km/square km	% multiple tracks	Length road net in km/square km
Switzerland	125	32	1734
Germany	122	42	1995
Netherlands	22	77	776
England	69	70	1549
United States	22	--	665
France	63	45	1471

Source Swiss Ministry of Transport (1992), based on UN data.

Tables 7a and 7b provide the answers. In the first table data on the USA and Switzerland are missing, while in the second table data on the number of kilometres per citizens are lacking. Even more striking is the difference in outcomes for the Netherlands: the statistics in the second table give it a road and rail network that is smaller by a factor 4. When asked, the responsible sources were unable to clarify or explain the gap in the respective outcomes. Switzerland, on the other hand, is given a very huge rail network, while the SBB wrote that it had the most limited budget in relation to the number of passengers after the Netherlands (SBB 1989). Since then, not many extra kilometres have been constructed. Yet, on the basis of this, some conclusions can be made:

1. The networks in England and the USA are limited, as expected.
2. The German and French networks are extensive, especially rail. The Swiss networks appear quite sizeable here, but it is possible that extra cantonal data have been added.
3. The exact size of the Dutch network is unclear. It is true, though, that the infrastructure networks in the Randstad are less extensive than in the Ruhr Area. Intensive service delivery through efficient use of (limited) infrastructure is a common practice in the Netherlands - this makes the current network sensitive to growth of traffic. The Netherlands is a typical type 4 here after all.

TNO-INRO write about the road networks in the Ruhr Area, Randstad and the Flemish city triangle:

> The highway network in the Randstad is substantially more pressured than in the Ruhr Area and the Antwerp-Brussels-Ghent region. The day-intensity per lane is on average 20% higher. In all three regions, the most pressured connections are found around and between the large cities. (...) In addition, the supply of other through-going roads is far behind the supply in the Ruhr Area and around Antwerp-Brussels-Ghent. In the Randstad there is no cohesive road network contrary to the other two regions. As a consequence there are more and shorter replacements via the highways (TNO-INRO 1996: i-ii).

In addition, TNO-INRO supply the data presented in table 8:

Table 8. Size of road networks in three regions

Area	Network length in km/1,000,000 inhabitants	Average number of lanes	Lane km/1,000,000 inhabitants
Randstad	99	4.87	480
Ruhr Area	118 (+19% as compared to Randstad)	4.42	523 (+ 9%)
Flanders	105 (+6% as compared to Randstad)	5.44	571 (+ 19%)

Source: TNO-INRO 1996.

Earlier, TNO-INRO (1995) concluded that the quality of public transport service delivery in the Randstad is good in comparison to other areas, but the infrastructure was limited and intensively used. By way of summary the Randstad is characterised by a small but intensively used rail infrastructure network. There are approximately 170 kilometres of rail tracks in the Randstad per million inhabitants, while there are 236 kilometres in the Ruhr Area and 305 in the Antwerp-Brussels-Ghent area. The frequencies are much higher, so that the number of car kilometres per million inhabitants is roughly the same.
All things taken together, the hypotheses about the size of the infrastructure networks remain unrefuted.

5.3 Congestion in the networks

Table 3 predicted that England and the Netherlands (to a lesser extent) experience chronic congestion problems and France experiences hardly any congestion. The other countries experience 'manageable' congestion. Here, table 9 presents the empirical evidence.

Table 9. Saturation of infrastructure

Country	Average use of road net in vehicle km/ length road net in 1,000,000/km (1992)	Average use of rail net in train km/ length rail net in 1000 train km/km (1993)	Use waterways of class IV and higher in 1,000,000 ton km/km (1992)
Germany	0.83	21	18
Netherlands	0.87	25	18.5
England	1.06	22	0.2
France	0.49	12	4.5

Source: Dutch Ministry of Transport 1996.

Another indicator for the same phenomenon is provided by ECIS (1996) in table 10.
With respect to congestion in the USA, only data for urbanised areas have been collected, and then in quite a different manner than in Europe. These data include, for instance, recording car hours of delay per day per 1000 people and the costs of congestion per individual of the population. In these terms, the Western and North Eastern states, where you will also find the largest cities, appear to suffer most from congestion: San Bernardino River (California) with 200 hours per 1000 inhabitants per day and $870 per person per year, San Francisco-Oakland (California) with 180 hours per 1000 inhabitants and $760 per person per year, Washington D.C. with 180 hours and $740 and Los Angeles (California) with 160 hours and $660. Given the different measurement methods and spatial structures, comparisons between the USA and Europe are not particularly useful.

Table 10. Percentage of road connections experiencing congestion (in hours)

Country	0-1 hours	1-2 hours	2-3 hours	3-4 hours	> 4 hours
Switzerland	93.6	0.0	0.0	0.0	6.4
Germany	92.1	0.6	0.8	1.2	5.3
Netherlands	85.2	3.8	2.8	3.1	5.2
England	75.9	3.7	6.5	2.8	11.1
France	95.5	0.0	0.5	0.5	3.6

Source: ECIS 1996.

There are no comparable statistics for rail, but ECIS provides general indications: Switzerland, the Netherlands and England do less well in terms of congestion on rail, and in that order. France hardly has any problems, and Germany experiences pressure in some regions such as Berlin, the Ruhr, and Rhein-Main. No data are available for the USA.
The predictions of under-capacity in the Netherlands and England and over-capacity in France are clearly demonstrated in the tables. The ‘limited congestion’ in Switzerland and Germany is expressed in middle positions. Some congestion can be efficient (it is not wise to build so much that there never is a traffic jam), but it must remain 'manageable'.

5.4 Level of investments

Table 3 predicts that the infrastructure expenditure is lowest in types 3 and 4 (USA, England and the Netherlands) and highest in Germany, Switzerland and France (types 1 and 2). In types 2 and 4 (France, England and the Netherlands) there is much attention for quantity construction (a few big projects), while in types 1 and 3 (Germany, Switzerland and the US) there is much attention for quality construction of a much smaller number of projects- either to protect nature or through higher expenditure on rail.
The ECIS figures are presented in table 11.

Table 11. Infrastructure expenditure (1993), including maintenance (1994 prices)

Country	Total/ capita	Road/ capita	Rail/ capita	Total % GNP	Road in % GNP	Rail in % GNP
Switzerland	478	302	166	1.55	0.98	0.54
Germany	252	167	54	1.37	0.91	0.29
Netherlands	151	88	37	0.85	0.50	0.21
England	139	94	30	0.97	0.66	0.21
France	233	147	68	1.22	0.78	0.36

Source: ECIS 1996.

American expenditure definitions are not standardised with the European definitions and are thus not incorporated in this table. The figures that the Dutch Ministry of Transport (1996) provides differ slightly since the situation for England is a little less and for the Netherlands a little more favourable. This is the case for both roads and railroads. In general the outcome is the same. The report also provides figures on inland waterways as collected in table 12.

Table 12. Expenditure for waterways (1995)

Country	Investments per capita (in fl 1.00/inhabitant)	Investments in waterways/length of waterway network (in fl. 1000/km)
Germany	37	290
Netherlands	44	140
England	0	0
France	6	50

Source: Dutch Ministry of Transport 1996.

The low figures for England and France are not really surprising: their inland waterway network is very small and they choose to keep it that way. The proportions of Germany and the Netherlands are remarkable: the Netherlands is the waterway champion, but appears to pay relatively less attention to the network than Germany.
All in all, the tables confirm the prediction about Switzerland, Germany and France as strong investors. In the Netherlands and England, the costs for resolving congestion points are apparently deemed too high.
Infrastructure construction is less easy to express in figures with regard to quality. Qualitative indications can be provided. Spatial fit in Germany and Switzerland and the Netherlands (which otherwise goes along with type 4 in that it focuses mainly on big projects) is often established through high investments in public transport systems, high expenditures on tunnels that preserve nature areas or track adaptations to preserve inhabited areas and nature areas. Both in the Netherlands and the USA, the principle of compensation is relevant, where the demolition of nature is supposed to be compensated through the creation of new nature areas. In America, nature protection is also pursued via non-attainment areas; these are areas where construction is totally prohibited (De Jong 1999). In France, it was predicted that infrastructure capacity is considered more important than the environment in light of the relationship between infrastructure capacity and congestion with regard to investments. Also, the maintenance of infrastructure is considered of lesser importance (Fourniau 1995, Dutch Ministry of Transport 1996). The same is the case in England, which can be derived from the fact that increased pressure of environmental interest groups is not answered by better spatial fit, but by withdrawing all projects considered problematic (De Jong 1999). A study by Hendriks (1996) showed how ring roads were constructed deep into the city of Birmingham with unpleasant consequences for the living environment, while Munich made substantial investments in systems of local and regional public transport.
All in all, as seen in the previous paragraphs, reality is quite nuanced and dependent on several factors, but the expectations expressed in table 3 are generally confirmed by the evidence.

6. Concluding remarks

In the preceding paragraphs, an attempt has been made to demonstrate a structural relationship between types of institutional structures on the one hand and processes and products of decision making on transport infrastructures on the other. This can be understood

by viewing how relationships of power and collaboration between actors influence the creation and sharing of relevant information. This differentiated use of information among the different institutional structures, at its turn, determines what type of infrastructure networks grow. For instance, type 1 structures with high levels of checks and balances and strong incentives to collaborate force actors to construct networks together, because they feel they depend on each other and the regulations punish them in one sense or another for opportunistic behaviour. This makes intermodal and public transport easier to realise, but those networks also take more time to develop and are probably relatively costly. The mutual checks that actors exert on each other mitigate the whimsical desires of each of them, leading to average network size and congestion levels (under supply or oversupply are effectively prevented). Actors involved in the decision making turn out to be generally happy about both quality of process and quality of product. Similar lines of argument have been developed for the other three institutional types leading to other process and product outcomes due to their different institutional characteristics. Though any relevant statistical exercise was precluded because of the limited set of countries, clear indications have been given that there is indeed a connection between institutional structure and infrastructure performance.

To further substantiate the theory and the line of argument and to make them statistically significant further exploration is required.

This paper just intended to be a first step in the direction of a greater understanding of the institutional foundations of transport and infrastructure networks. Other fields such as traffic safety could also benefit from such international institutional comparisons. It promises to be a productive line of thought, because it opens up a deeper insight into the politico-administrative context in which policy measures are taken. Countries learning from each other's experiences can be a rich source of policy learning. This is becoming only more relevant in the context of wider EU transport planning where data and knowledge is going to be shared and certain policies of harmonisation will have to be implemented. Increased knowledge of each other's systems will be put their own systems in comparative perspective and help policy-makers to fine tune them as well as serve as basic building blocks to have these systems grow more similar in the years to come.

References

Banister, David (1994) *Transport Planning in the UK, USA and Europe*, E&FN Spon, London.

Beckford, John (1998) *Quality. A Critical Introduction,* Routledge, London/New York.

Bertolini, Luca & Tejo Spit (1998) *Cities on Rails. The Development of Railway Stations and Their Surroundings*, E&FN Spon, London.

Cervero, Robert (1998) *The Transit Metropolis. A Global Inquiry*, Island Press, New York.

Chisholm, Donald (1989) *Co-ordination without Hierarchy. Informal Structures in Multi-organizational Systems*, University of California Press, Berkeley/Los Angeles.

Confederation of British Industry (1995) *Missing Links. Settling National Transport Priorities*, a CBI discussion document, London.

De Bruijn, Hans, Ernst Ten Heuvelhof and Martin de Jong (1994) *Het infrastructuurfonds tussen inhoudelijke norm en politieke afweging*, Ministerie van Verkeer en Waterstaat, Den Haag.

De Jong, Martin (1999) *Institutional transplantation; how to adopt good transport infrastructure ideas from other countries?*, Eburon publishers, Delft.

De Jong, Martin, Henrik Stevens and Wijnand Veeneman (1996) Evolving Transport Concepts. Railway Development Schemes in Switzerland and The Netherlands, in: *TRAIL Conference Proceedings, May 1996*, Rotterdam.

Dobbin, Frank (1994) *Forging Industrial Policy. The United States, Britain and France in the Railway Age*, Cambridge University Press, New York.

Dunlavy, Colleen A. (1992) Railway Policies in 19th Century Prussia, in: Steinmo, Sven, Kathleen Thelen and Frank Longstretch (eds), *Historical Institutionalism in Comparative Analysis*, Cambridge University Press, Cambridge.

Dutch Ministry of Transport (1996) *Internationale vergelijking infrastructuur. Nederland, Duitsland, Verenigd Koninkrijk, Belgie, Frankrijk*, SDU Uitgevers, Den Haag.

European Consortium for Infrastructural Studies (1996) *The State of European Infrastructure*, Rotterdam.

Fourniau, Jean-Michel (1995) Evaluation et conduite des grands projets d'infrastructure de transport. Des expériences de renouvellement encore hésitantes, paper presented at the international colloquium Grandes infrastructures de transport et territoires, June 1995.

Gerondeau, Christian (1997) *Transport in Europe*, Artech House, Boston/London.

Hendriks, Frank (1996) *Beleid, cultuur en instituties. Het verhaal van twee steden*, DSWO Press, Leiden.

Huigen, Jos, Paul Frissen and Pieter Tops (1993) *Het project Betuwelijn. Spoorlijn of bestuurlijke co-produktie*, Katholieke Universiteit Brabant, Tilburg.

Katholieke Universiteit Brabant & TNO-INRO (1997) *Infrastructureel investeringsbeleid in vergelijkend perspectief*, Tilburg/Delft.

Kolpron Consultants BV (1994) *Besluitvorming over grote infrastructuurprojecten in een aantal Europese landen*, Ministerie van Verkeer en Waterstaat, den Haag.

Merlin, Pierre (1994) *Les transports en France*, La documentation française, Paris.

Moser, Peter (1993) *Why is the political system of Switzerland so stable?*, Discussion paper no. 72, University of Skt Gallen, Skt Gallen.

Nederlands Economisch Instituut (1991) *Majeure ruimtelijke en infrastructurele operaties in grootstedelijke agglomeraties in Noord-West Europa*, Rotterdam.

Salomon, Ilan, Piet Bovy & Jean-Pierre Orfeuil (eds) (1993) *A billion trips a day; tradition and transition in European travel patterns*, Kluwer Academic Publishers, Dordrecht/Boston/London.

Schweizerische Bundesbahnen (1989) *Bahn und Bus 2000. Von Konzept zur Planung*, Sonderdrück Schweizer Eisenbahnrevue, Bern.

Siddiqui, Frank (1996) Een duistere club. De lobby achter de Betuwelijn, in: *Intermediair*, 20 December 1996: 6-15.

Swiss Ministry of Transport (1992) *Mobilität in der Schweiz. Bericht zu Handen der Kommission für Verkehr und Fernmeldewesen des Ständerates*, Bern/Zurich 1992.

Tavasszy, Lorant A., *Modelling European Freight Transport Flows*, The Netherlands Research School for Transport, Infrastructure and Logistics, Delft.

Teisman, Geert H. (1995) *Complexe besluitvorming. Een pluricentrisch perspectief op besluitvorming over ruimtelijke investeringen*, VUGA, Den Haag.

TNO-INRO (1991) *De evaluatie van openbaar vervoerinvesteringen*, TNO Beleidsstudies, Delft.

TNO-INRO (1995) *De kwaliteit van de infrastructuur binnen metropolitane gebieden in Noordwest Europa*, Delft.

TNO-INRO (1996) *Vergelijking aanbod en gebruik hoofdwegennet in enkele Europese metropolen*, Delft.

US Department of Transportation & Bureau of Transportation Statistics (1996) *Transportation Statistics in Brief*, Washington.