

Carlo Santulli T860/Project Report R1749219

T860 Environmental Decision Making: a system approach -
Project Report

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R1749219

**NOTTINGHAM EXPRESS TRANSIT LINE 3:
A TRAMLINE FOR BEESTON AND CHILWELL.
OPPORTUNITIES AND ENVIRONMENTAL ISSUES.**

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1. SUMMARY

This study concerns the issue of tramline construction, envisaged in Beeston and Chilwell, Nottinghamshire. It was recognised that this is an environmental issue, in that it includes elements of social (problems during construction) and environmental (damage to vegetation, high noise level disturbance to impingement concern).

Main problems encountered were the diverse nature of the stakeholders, in some cases (e.g., Broxtowe Council) uncertain about the role to play in tram discussion, and the combined presence of environmental and economical requests on the project.

The main conclusion is that the tramline is needed for a relief on traffic and a possible reduction of car use, that the present public transport net is not able to achieve: however, the project needs to be optimised, minimising its impact on the environment, and this aim can only be reached with a concerted action of all the components, including clear and effective communication patterns.

2. INTRODUCTION

In Beeston, Notts., a tramway line (Nottingham Express Transit -NET-line 3) has been proposed, crossing the town centre and connecting it with Nottingham and Chilwell. Positive elements of the project appear to be reduction in car and bus pollution and increase in overall mobility in the area. However, among residents there is also environmental concern over tram noise and destruction of green areas is also present. It is therefore necessary to verify that environmental benefits are reached at an unacceptable price in terms of change of state of the physical environment. This would include destruction of vegetation in Wildlife Trust Kings Meadow Reserve and the Green Corridor from Beeston to Wilford and Chilwell, transformation of the area surrounding Beeston Square that would alter its Victorian-Edwardian character and promotion of other developments, including a new superstore, in Beeston town centre. The discussion on these themes is very strong locally: organisations in favour (BACIT) or against the tramline (BCBRA) are active in town since 2001.

The aim of this work is to evaluate whether the tramline project can bring a substantial environmental benefit to this area. Different stakeholders perspectives will be looked at, including some organisations participating in the decision-making process (local government, NET), residents in favour of the tram solution (including me) or against it, and organisations or individuals affected by the tramline (National Wildlife Trust and local shop-owners).

The application of the framework to the solution of this environmental issue included first an analysis of the context (Section 4). Here, the framework provided useful concepts, in particular to include the tram issue into the more general aspect of development of sustainable transport systems, on which a large amount of studies and literature are available. Different stakeholder perspectives were included (Section 5),

with the framework providing information to understand the concept of vested interest and stake holding.

The part on evaluation and monitoring (Sections 6-7) makes in contrast a limited use of the framework, based especially on the comparison of the predictable effect of the tramway with other cases of already operating tramlines. A difficulty encountered in a wider application of the monitoring/evaluation framework is the large and non-homogeneous number of parameters to be worked out, and the very different situations e.g., in terms of traffic, noise and pollution of the different towns/cities considered for comparison with the NET system. This led to the conviction that the main actions required (Section 8) would regard promoting communication among the people affected by the tramline, considering a complete refusal of the tramline option as a too large cost, both for the environment and the number of contrasts possibly raised. It is important that the tramline is optimised as far as possible: this work aims to give some guidelines for action, together with a critical assessment of how the framework was used throughout (Section 9).

3. RESEARCH DATA COLLECTION

Information on the tramline project have been mainly collected over the Internet, in NET website (www.nottinghamexpress.com) and in those of the pressure groups in favour (BACIT: www.bacit.org) or against the tram construction (BCBRA: www.notram.net). In addition, a number of local newspapers published updates on the tram issue, including Beeston Express and Nottingham Evening Post, hosting also pro- and anti-tram letters. Other information was obtained from the Internet-based BACIT discussion group, which, in spite of its pro-tram orientation, reported official

documents and reports of tram action groups. In addition, first-hand information on the tram issue was obtained from BACIT chairman and members of BCBRA.

General information on how the tram would affect the life of a city and what can be the technical background and the expectations for the tram revival (in Nottingham e.g., the service was scrapped in 1935) were also obtained from some papers in technical literature, which are reported in References. In this regard (tramline revival and expectations for environment and town life), the discussion over the planned tramline in Verona, Italy, was deemed to be equally useful to understand the problems and opportunities of a tramline. Verona has a number of similarities with Nottingham, including the number of inhabitants, the average daily traffic, the geography, being a city with low hills and crossed by a river, and the presence of just one large railway station, that absorbs almost all the train traffic. This comparison was suggested by the fact that most pro-tram arguments are supported by the effects of the tramline in other English cities, although the possible examples may have differences with the Nottingham line 3 case. These are Croydon (the tramline is a part of London connections), Sheffield (with a very different geography and social characteristics from Nottingham) and Manchester (the tramline is integrated to a complex railway system).

4. A TRAM IN BEESTON AND CHILWELL: THE CONTEXT. PROBLEMS AND OPPORTUNITIES

The decision-making framework allowed to establish that the tram case is an environmental situation, because elements that would affect either the life of people living or working in the area or the conditions of local environment are present. In this sense, the "interplay between actions within the domain of the natural sciences and

those which fall within the scope of social sciences" [1] is the field in which this issue appears to be dealt with. The significance of the tramline to environment is especially due to its nature of *sustainable transport system* and in particular to its ability of "minimise other unintended consequences, such as inducing stress or ill-health" [2]. It seems appropriate in this context to use the concept of *acceptable risk*, as defined in the Health and Safety Executive (HSE) approach, mentioning in particular the aspect of "willingness to live with a risk to secure certain benefits and in confidence that it is being properly controlled" [3]. This aspect has been found to be particularly critical in the tram discussion, where setting a widely recognised level of acceptable risk implies caring for the opinions of the public and promoting sufficient communication.

Two consequences of not doing this can be worked out from the "context setting" stage of the framework, namely setting inappropriate system boundaries and not clarifying problems and difficulties of the tram issue. The aspect of boundary setting has been investigated dealing with the decision-making system, where the concept of "more abstract boundaries [...] to define and negotiate limits" was encountered [4].

Following from the above considerations, the problems and opportunities raised by the tramline issue are examined according to different perspectives and spotting counterintuitive behaviour [5]. In particular, these can be seen as concentrated in three areas: reduction of pollution levels, damage to Natural Reserve and general development in the area as an effect of the tramline construction, including possible opening of new department stores, new housing and additional parking spaces. In addition, the tram noise has to be considered, especially because there are locally strong feelings and perceptions, in spite of the fact that in a similar case of tramline construction (Croydon) the tram was rather perceived as a factor of reduction of traffic noise [6]. In this regard, an influence on this concern has surely been played by

the presence of a number of nursing houses in the Chilwell area. In Table 1, musts and wants of the project are presented, as defined in [7], the former being the conditions that the tramline has to fulfil in order for the project to go ahead, whilst the latter are conditions which would be preferably realised, but that will not alone cause acceptance/rejection of the project.

Musts	Wants
Limit the damage to the green belt	Reduce the level of noise especially in sensitive areas (e.g., proximity of nursing homes)
Improve overall mobility at an acceptable cost	Reduce the distance from the services (Public transport stops)
Reduce pollution from cars and buses	Promote redevelopment of derelict area in Beeston town centre in a way respectful of social and physical environment

Table 1 Musts and wants of the project

These general considerations introduce a more detailed discussion over stake holding and different perspectives in the tram project (Section 5).

5. STAKEHOLDERS ANALYSIS

In the definition by Gray [8] and Pasquero [9] stakeholders are: "Individuals who hold some vested interest in the system being addressed, such as agencies, governments, interest groups and affected parties". "Vested interest" means, as suggested by Sagoff

[10], that a stakeholder needs to have more than an economic interest in a system. Stake holding encompasses the need of exchanging information and resolving conflicts i.e., to co-ordinate the efforts in order to optimise the system.

In the specific case of tram extension to Beeston and Chilwell, a number of anti-tram protests came from shop-owners, especially along Chilwell Road, where parking is going first to be forbidden in consequence of tramline construction, and then subjected to some restriction in presence of the tramline. These cannot in strict sense being considered stakeholders, if they think that the tram will solely affect their business. However, reflecting on the impact of construction and the possible claims for compensation by shop-owners, a more correct setting of the boundaries would include also the environmental and social disruption this will cause. Communication is once again critical, in the sense of minimisation of contrasts, in an effort of "identify local priorities for research and initiate participatory research" [11].

In addition, the construction stage can itself carry some NHS costs for noise and possibly pollution, and different construction methods and timescales can lead to more or less conflicts.

The following diagram of decision-making system for the tramline issue (Figure 1) has been found helpful in drawing with more completeness the situation. Initially, the aspect of possible new investors was also ruled out of tram issue. Lately, however, the diffuse perception of the real link between the transformation of Beeston town centre and the tram has suggested to insert new investors among those affected by the tram decision and that would possibly try to influence it.

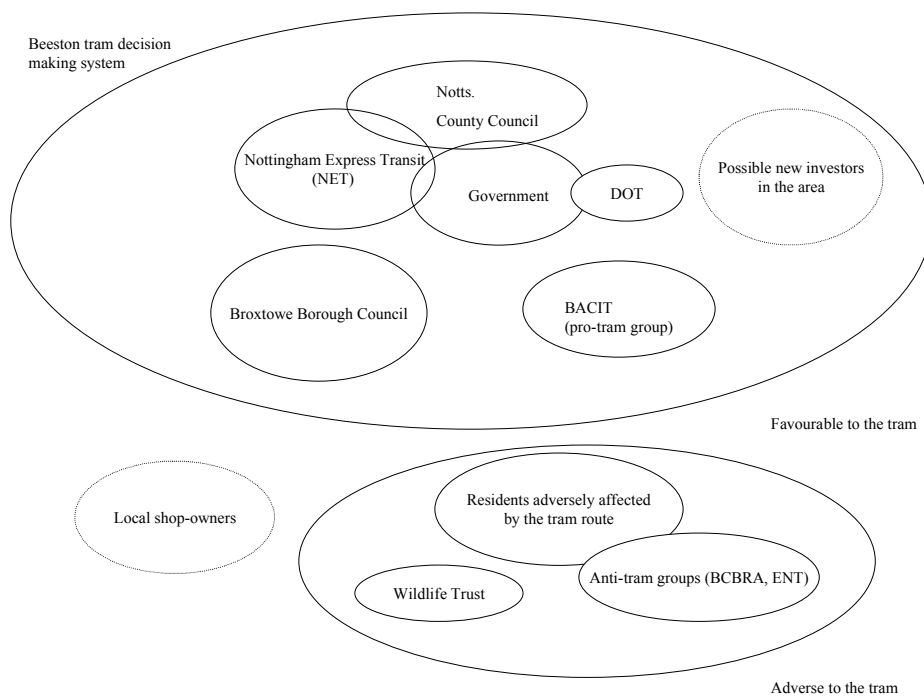


Figure 1 Decision-making system for the Beeston tramline (NET line 3)

In trying to explain the tram problem as a mess, on the evidence of activity of anti-tram and pro-tram people a stepping back procedure was applied, to understand what makes a person an anti-tram rather than a pro-tram or vice versa. As an initial approximation, noise, mobility, pollution from traffic and environmental damage are issues the tram can hardly be considered neutral on. However, other issues are still unclear: for example, in general tramlines and light railways reduce the overall environmental cost of mobility in cities of intermediate size, such as Nottingham “Tram and LRT (light railway train) systems are appropriate to fill the gap in capacity between bus and metro at construction expenses of about a tenth of a metro system” [12] (Table 3). However, the environmental impact needs to include land occupation to create the large parking spaces, which in the case of NET line 3 is needed to serve the park-and-ride facilities at the Chilwell end of the tramline and possible new

developments in Beeston town centre.

A specific position of stake holding is occupied by Nottingham Express Transit (NET), a partly private company acting in partnership with national and local government and in accordance with government objectives: environment, safety, economy, accessibility and integration [13]. Of course they have an economic interest in the construction of tramline, but in the specific case of the extension to Beeston and Chilwell of the tram network, NET is playing an active role, promoting public acceptability of the route, chosen by the Department of Transport as essential to promote sustainable mobility in the Greater Nottingham. In contrast, it is not at all clear from the context setting framework, probably because it involves more communication paths than environmental policy, the relation, if any, between NET and the Broxtowe Council (no overlapping of the two is provided in Figure 1). The latter is responsible for some aspects of tramline setting e.g., enforcing parking regulations, but its communication with NET does not seem effective, and the role of interest groups will be greater in influencing NET decisions about the choice of the final route. According to a Broxtowe Council member, Broxtowe BC are "consultee (though in general sympathy with the tram)" [14], which is probably not sufficiently helpful to understand if they will (or would like) have any role in selecting a route for the tram and resolving related contrasts. In addition, a generic sympathy for the tram does not appear to represent any judgement on the environmental value of the project. Another partially unresolved stake holding position is the one of Wildlife Trust, since the proposed route will pass close to the Wildlife Trust Kings Meadow Reserve and, as declared also by NET [13], there could be a loss of habitat and a significant impact on wildlife. Wildlife Trust is in principle not connected in anyway to the tram, but it aims minimising the negative consequences of construction and operation of the

route. However, it did not make contact, at least officially, with other anti-tram groups, probably because they often try to lobby on local issues (e.g., street parking in presence of tram route) in which not always the link with environmental preservation is clear.

The application of a general concept, such as sustainable development, appears slightly inappropriate in this case, if a clear definition of what this will mean in practice in the tram situation is not given (e.g., Hoole and Milne, 1995 [15]). This should include setting appropriate parameters for the evaluation of environmental impact, parameters that need to be obtained from the aims of the tram project, as worked out in problems and opportunities (Section 4). In this respect, it is crucial to understand who formulated the problems the tramline can apparently resolve [16].

As a consequence, the sign diagram in Figure 2 is mainly aimed at working out the environmental component of the tram issue. This has in fact quite obvious social aspects, because there is need for improved mobility in this area and conversely some people are going to be affected by the tram route and will receive compensation for the land use or for other reasons.

The problems connected with tram construction were left out of the diagram, to concentrate on the impact of the tramline once realised: of course the construction itself can carry some NHS costs for noise and possibly pollution. At a later stage, however, it may become interesting to know whether a method for conducting tram construction would lead to more or less conflicts and then costs for compensation, etc. This is anyway an objective that is comes only once we have assessed that the tram line 3 to be realised, and the route has been totally defined. A provisional route is available on the NET site and still open for discussion, but not many residents in the area know this (Section 8).

On a personal note, I live in a *cul-de-sac* street in Beeston, not interested directly by the tram route, but not far from it (minimum distance about 200 metres). I am likely to have more advantages than disadvantages from the tram, since some issues (noise, disruption of traffic and improved pollution for cars diverted and possible traffic jams in other areas of Beeston town) are likely to affect me only marginally. At the beginning of the project I was biased in favour of tram and light rail developments, but my perspective was rather partial. For example, all the problems connected with the construction stage did not participate in my reflection at that time and I had no idea of the extension of the Green Corridor in Chilwell. My perspective has been slightly altered in the sense that I was able to look at how future outcomes of the project could be predicted, learning to "think imaginatively about what your alternative situations are there, what the possibilities are, what designs could be brought about". [17]

6. SELECTION AND ANALYSIS OF SUSTAINABILITY PARAMETERS

On a project still under discussion, such as this tramline, three boundary-setting questions were identified: these concern *the beneficiaries of the system*, *the environment of the system* and *the measure of success* [18]. These considerations will allow a number of sustainability parameters to be set and measured (or rather predicted) in the analysis part (Section 7).

The beneficiaries should be *in principle* all those living and working in the area, although in reality not all the areas are likely to benefit in the same way of the tramline being built. In this sense, the average use of the tramline (number of passengers/day*1000 inhabitants) is probably not sufficient to give an idea of the success of the tram.

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As observed, the real issue is represented by measuring the success of the tramline. As a general consideration, the tramline will be successful if its "musts" and possibly "wants" will be realised with limited, if any, environmental damage, resulting in no large conflicts present locally.

This should be assessed using sustainability parameters, selected in the list presented in Block 5 p.43 [19]. Eight parameters were in particular selected: two are perceived parameters (perception of air pollution problems, perception of noise problems), other two are social parameters (travel distance to work, distance for basic services i.e., bus stops) and the last four are physical/environmental (traffic accident rate, area of green space versus area devoted to the private car, air pollution, environmental noise level).

Some observations on the parameters can be provided: perception of noise problems is very strong, especially in the Chilwell extension, whilst "ambient and background noise levels vary widely through Beeston, Chilwell and Wilford according to location" [20]. This impinges on the acceptance of trams, which can be higher in the town centre than in the less densely populated area of Chilwell: conversely, the tram use would probably be higher in Beeston town centre, where more concern for pollution is present.

Distance from public transport stops is critical: in particular, trams may be less popular, because the distance between stops may be longer than with buses (Table 3): on the other side, a double-carriage tram, as those to be used by NET, can transport twice as many people than a bus. Also, the effect on traffic is probably better worked out with the number of accidents and related costs rather than on the number of cars taken off road: this looks promising at a first sight, but the average occupancy of a car being very variable with the time of the day and location, it is very difficult to deduct how many cars will be off road from the expected people mobility on the tramline.

7. A MODEL FOR THE PROJECTED TRAMLINE: MONITORING AND ANALYSIS

Among the types of models available in environmental decision making, a graphical influence diagram and a system map were used with specific aims: sorting out the tramline effects, spotting the presence of any feedback, and decision-making system for the tram respectively.

In principle, the use of photos or iconic models to describe the situation would have been useful. However, as in the case mentioned in [21], this aspect of photographs has been exploited already in the "tram issue". BCBRA presented a poster showing a shot of Radford Road during works for line 1, giving large evidence to the metal protection of the worksite, whilst BACIT replied with shots of the modern supertrams in Sheffield, but taken on the outskirts of the city, in a vegetation-rich area, and not in the town centre. This is to say that an iconic model could be hardly believed to be unbiased in this discussion.

The majority of discussions about the tramline can be ascribed to the possible absence of robustness in the project, or surely to the lack of communication about the real robustness of it, that can be determined using appropriate scenarios: "Detailed description of an ideal design of a service or a projection into the future [22].

To predict scenarios obtained due to the influence of tram on traffic, noise and pollution, mathematical models for optimisation can be used in the tram. In particular, four situations can be identified, bearing in mind that probably the real situation is going to be a mix of all these possibilities, e.g. considering the possibility that developments can be only partially realised:

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- Scenario A: developments connected with the tramline are realised, including additional parking spaces, whilst global people movement in the area stays the same. N people (to be measured from the envisaged frequency and occupancy of trams) are transported via the tramline.
- Scenario B: no new developments are realised, and global people movement stays the same again, of which N are again transported via tram
- Scenario C: no new developments are realised, but as an effect of the improved transport in the area, people movement is increased by y%, of which N+x are transported via tram
- Scenario D: new developments are realised AND people movement in the area is increased by z%, as a consequence of both these effect and N+t are transported by tram

In all of the scenarios, the eight parameters for sustainability (Section 6) would need to be monitored.

8. TAKING ACTION: PROMOTING COMMUNICATION ON THE TRAM ISSUE

There have been a number of actions trying to establish communication patterns: however, these have been usually focused on specific aspects, without working out the global impact of the tram system on Beeston town centre. In this way, these have been only effective to a point, but stakeholders did not appear to have worked together on the whole of the project.

For example, NET has been calling for extensive consultations on the envisaged tram development, especially trying to define the number and location of tram stops as

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related to the needs of the residents. However, the communication process was more aimed at the optimisation of tram network than at looking to local issues raised by tram extension in Beeston, as the anti-tram groups frequently perceived it. On its side, the pro-tram group of interest (BACIT) called for citizens, by organising trips to places where the tram is operating already (Croydon, Sheffield), especially concentrating on the noise and the car use issues. The anti-tram groups (BCBRA, ENT) have also raised the question of destruction of green areas and of the unduly transformation of town centre, triggered by the tram line, with the possible installation of big stores (Tesco) which would in the end increase, not reduce car use and pollution. Antitram groups propose in alternative the reconstruction of a part of the Great Central Railway (GCR), which would serve the outskirts of Beeston, without really penetrating into the town centre. Another question which seems unclear is how the presence of the railtrack in narrow streets such as Chilwell Road, would allow cycling, as claimed by BACIT on the basis that a tram occupies less space than a bus. As a general consideration, although extensive consultations have been taking place by means of public meetings, set-up of stalls in Beeston Square or exchange of letters on a number of local newspapers (including Nottingham Evening Post and Beeston Express), the respective systems of interest remain rather distant and real communication is difficult and occasional. In other words, attempts made so far to improve communication did not help to resolve conflicts. Negotiation seems difficult, in that the real issue is not "yes/no to the tram", but getting a better transport system with some environmental gain (e.g., less pollution, less car use). Car use to travel to work is still very heavy in the outer parts of Nottingham, including Beeston, as reported in Table 4.

In addition, this system should ideally give little, or possibly, no added problems (destruction of green areas, occupation of space, inappropriate settlement of too "heavy" structures, such as big stores in the town centre). Dealing with communication, the result of Nottingham Evening Post (August 2003) opinion poll showed interest for the tramline (Table 5). However, as above mentioned, the comparison with other realities to try to depict how the tramline "will look like" can only be cautiously used (see Table 6, where the comparison between Hillborough, in Sheffield, and Beeston, shows that the influence of the tram on economy can only be perceived if the initial conditions of the places are accounted for). Verona in Italy, in a situation similar to Nottingham, the tramline project found increasing difficulties for compensation claims and protests over tram noise, only resolved through the reference to the requirements of Agenda 21 in terms of car use and non-polluting public transport access to city centre [23].

In the Beeston-Chilwell case, this could also be applied in terms of participatory monitoring: a common feeling is that many different data have been collected from different organisations, in favour or against the tramline, or with a neutral perspective. Now, what can be needed is a technique that "shifts the emphasis away from externally defined data gathering, analysing and using the information. Thus monitoring moves away from an activity undertaken for, and by outsiders, to one that builds on local community activity" [24].

9. CONCLUSIONS

The tramline in Beeston/Chilwell (NET line 3) needs optimisation, more than pre-conceived positions. Optimisation, if not reached with a combined action of all the stakeholding components, risks to be reached only with technical considerations. In

the latter case, a number of issues may be ruled out, including the co-presence of bicycles and trams, the disruption of natural environment on all the green areas along the route (and not just the Wildlife Trust natural reserve) and the real and perceived noise level, considering the presence of "sensitive areas" (e.g., nursery homes).

The framework was useful in setting the context, explaining the stakeholding process and individuating the communication patterns. It allowed also the presence of negative feedback to be spotted, so to give suggestions on which parameters to include/not include in evaluation.

In contrast, the intertwined presence of economical and environmental considerations made the case difficult to be resolved through the framework. In particular, it would have been necessary to clarify in many protests whether a genuine interest for local (natural and social) environment was present or it was just NIMBYsm, if not a simple desire of asking for higher compensation by emphasising perceived damage.

10. REFERENCES

[1] Sloep PB, van Dam-Mieras MCE (1995) "Science on environmental problems" in Glasbergen P., and Blowers A. (eds.) *Environmental policy in an International Context: Perspectives*, First Edition, Arnold.

[2] Ison R, Blackmore C, T860, Block 2, p.10.

[3] Pidgeon N, Hood C, Jones D, Turner B, Gibson R (1992) "Risk perception" in *Risk: Analysis, Perception and Management*, Report of a Royal Society Study Group, pp.92-98, The Royal Society, London.

[4] Blackmore CP, Ison RL (1998) "Boundaries for thinking and action", in *Finding Out Fast: Investigate Skills for Policy an Development*, Thomas A, Chataway J, Wuyts M (eds.), Chapter 2, Sage, London.

[5] Casti JL (1994) *Complexification. Explaining a Paradoxical World Through the Science of Surprise*, Abacus, London.

[6] <http://www.Croydon-tramlink.co.uk/news/index.php?batchid=1057>

[7] Chambers R (1993) *"Challenging the Professions- frontiers for rural development"* Intermediate Technology Publications, London.

[8] Gray B (1989) *Collaborating: Finding Common Ground for Multiparty Problems* (San Francisco, Jossey-Bass)

[9] Pasquero J (1991) Supranational collaboration: the Canadian environmental experiment, *Journal of Applied Behavioural Science*, 27(1), pp.38-64.

[10] Sagoff M (1989), *The Economy of the Earth*, Cambridge University Press, Cambridge.

[11] Ison R, Blackmore C, T860, Block 2, p.68.

[12] Topp HH, Innovations in tram and light rail systems, *Proc Instn Mech Engrs* Vol 213 Part F pp. 133-141

[13] www.nottinghamexpresstransit.com

[14] www.bacit.org

[15] Hoole A, Milne G (1995) "Defining the features of sustainable development for a developing country: the Zimbabwe Case" *Journal of Environmental Planning and Management* vol.38 no.4, pp.505-517.

[16] Blackmore C, Furniss P, T860, Block 1, p.66.

[17] Ulrich W (1987) "Critical heuristics of social systems desing", *European Journal of Operational Research* vol. 31, pp.276-283.

[18] Hooker CA (1991) "Value system: notes towards the definition of agri-culture" *Journal of Agriculture and Environmental Ethics* Vol.7.

[19] Ison R, Blackmore C, TMA860 Block 5 p.43.

[20] Coles, R. and Wildish, L. (2002,c). "Predicted Acoustic Environmental Impact of Trams in Beeston, Chilwell and Wilford". Better Community Transport (BCT) Group, Beeston. BCT Report 3/02.

[21] Morris D, Cooke D, T860, Block 3 p.14.

[22] Wadsworth Y (1995) "The evaluation industry's toolbox of models and techniques" Chapter 5 in *Everyday Evaluation on the Run* pp.61-84, Action Research Issues Inc., Melbourne.

[23] Discussion with Prof. Alessandro Muratori, chairman of the FMP (Ferrovie Mantova-Peschiera) Action Group.

[24] Abbot J, Gujit I (1998) "Changing views on change", A Working Paper on Participatory Monitoring of the Environment, IIED, London, p.11

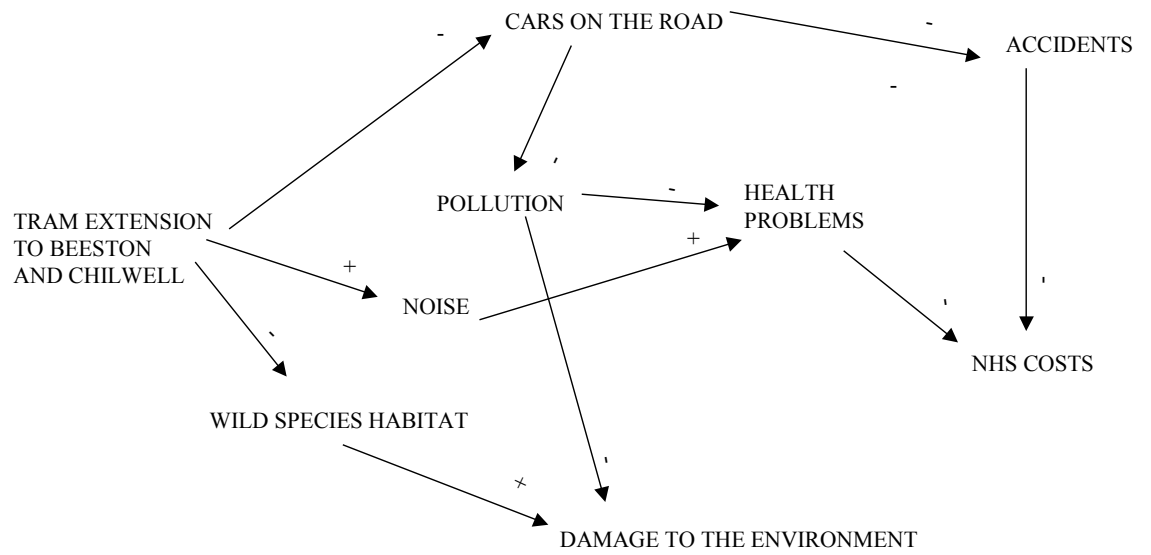


Figure 2 Signs diagram

APPENDIX

Table 2

Energy Use By Mode (MJ/Passenger km) (Lenzen, 1999)

<http://www.vtpi.org/tdm/tdm59.htm>

Urban mode	Embodied	Fuel	Total
Light Rail	0.7	1.4	2.1
Bus	0.7	2.1	2.8

Where embodied is the build energy.

Table 3

Proposed distance between stops in km (source: BACIT) (avg. for a bus 250 m.)

Inham Road / Eskdale Drive	0.48
Eskdale Drive / Sandby Court	0.67
Sandby Court / Broxtowe College	1.44
Broxtowe College / Imperial Road	0.36
Imperial Road / Beeston Square	0.43
Beeston Square / Middle St	0.70
Middle St / University Bvd	0.79

Table 4: Mode of Travel to Work by Residents (of Working Age) (%) (1996)

Source: Mobility Management in Nottingham (including Green Commuter Plans),

October 1997 University of Westminster & Nottingham City Council

	Centre	City	Outer	Total
Bus	17.0	25.9	14.1	19.1
Train	0.9	0.6	1.1	0.8

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Car	49.4	52.6	66.0	60.1
Pedal Cycle	2.2	3.1	4.7	4.0
Foot	27.2	13.9	10.8	12.3
All other	3.4	4.0	3.4	3.7
No. of Residents	3,240	90,440	119,610	213,290

Table 5

SURVEY ON THE TRAMLINE PERCEPTION

(Nottingham Evening Post, August 2003)

- a. 55% approve of the route line 3 (ours) is taking (30% disapprove)
- b. 72% believe traffic congestion has got worse
- c. 81% believe the effects of traffic pollution is serious
- d. 75% agree that improvements to public transport locally is necessary
- e. 78% believe that trams are a safe form of transport
- f. 58% believed that there would be through trams to Nottingham city centre
- g. 67% would definitely or probably use the tram
- h. 74% regularly travel into the areas served by the proposed tramlines
- i. 54% agreed that the long-term benefits would outweigh the disadvantages. (21% the opposite view)
- j. 75% believe the Chilwell Road shopkeepers should get compensation during construction.

(population of survey area=71,500, survey sample=994)

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Table 6 Comparison between Middlewood Road, Hillsborough, Sheffield, and
Chilwell Road, Beeston, Nottingham

	Middlewood Road	Chilwell Road
Total number of shops	75	55
Number of empty shops	8	6
Avg. cost of three bed detached house	95 k nr. tram 75k away from tram	140 k