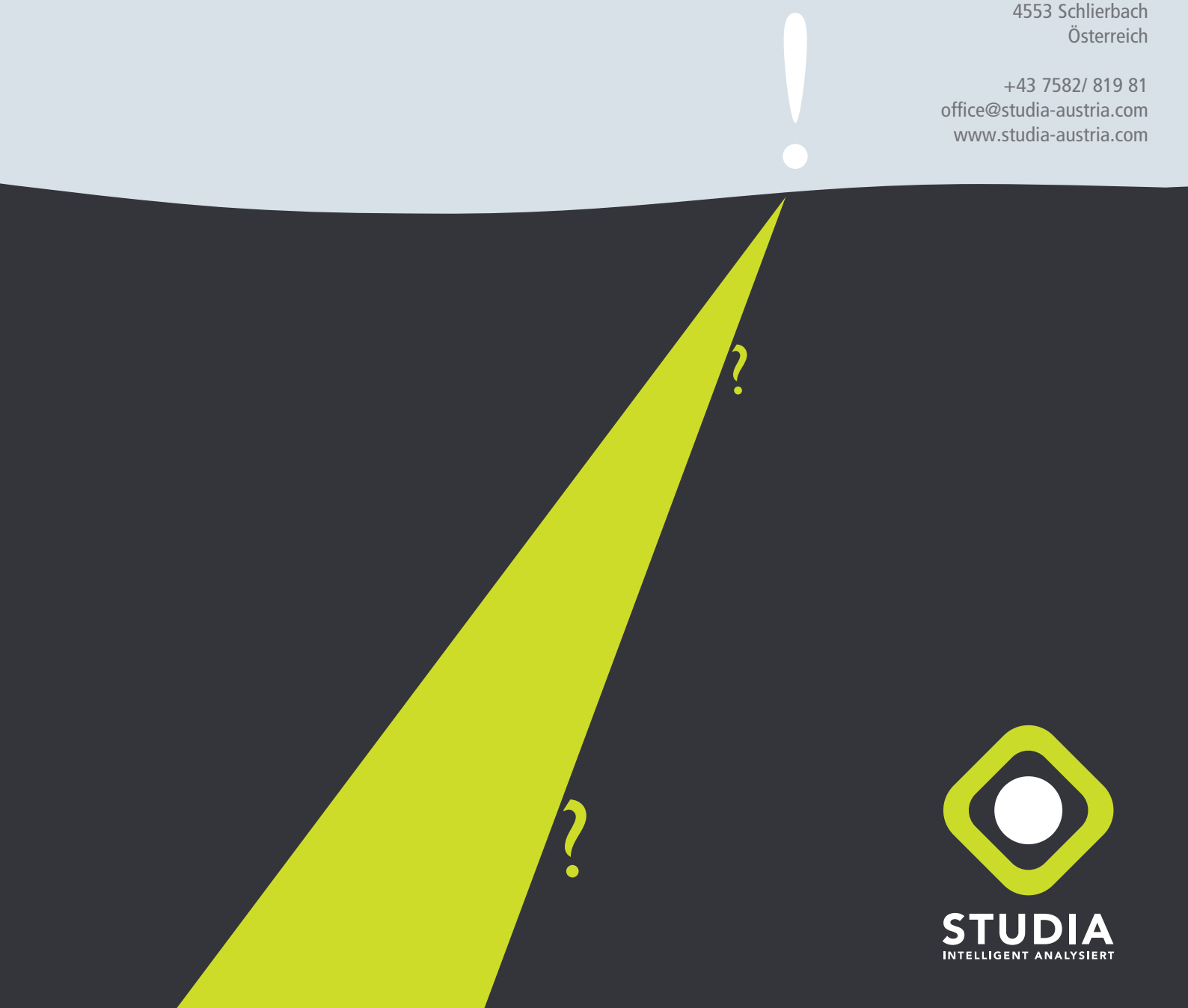
Edition Public Viewing

CAMELIA – Concerted Action Multigeneration Energy (Evaluating Acceptance)

provided by STUDIA

Panoramaweg 1
4553 Schlierbach
Österreich

+43 7582/ 819 81
office@studia-austria.com
www.studia-austria.com



STUDIA
INTELLIGENT ANALYSIERT

CAMELIA

Techno-economic impact and socio-economic acceptance (Work package 6)

Methodologies for the evaluation of socio-economic acceptance (Deliverable 6.1, part 2)

www.camelia-eu.com

Evaluating Acceptance

Date of issue of this document: 14th July 2006

Authors *Wolfgang E. Baaske* | STUDIA

Contact *STUDIA — Studienzentrum*
für internationale Analysen
Panoramaweg 1, 4553 Schlierbach
Austria
T +43 / 75 82 / 8 19 81-96 (-94 F)
office@studia-austria.com
www.studia-austria.com

Partners *PROFACTOR Produktionsforschungs GmbH* | Austria
IER: Inst. f. Energiewirtschaft und Rationelle Energie-anwendung, Univ. of Stuttgart | Germany
CNAM: Conservatoire National des Arts et Métiers | France

Project funded by the European Community
EC contract TREN/04/FP6EN/S07.31777/506486
Project acronym: CAMELIA
Project title: **Concerted Action Multigeneration Energy Systems with Locally Integrated Applications**

STUDIA
INTELLIGENT ANALYSIERT

Contents

Acknowledgements

Project funded by the European Community,
EC contract TREN/04/FP6EN/S07.31777/506486

Project acronym: CAMELIA – Project title: Concerted Action
Multigeneration Energy Systems with Locally Integrated Applications

1 Basic definition socio-economic acceptance

Benefits

Energy supply in buildings concerns many people. Only few people live on an island, where it does not matter, how their neighbours will be affected by a certain measure. Providing energy will create noise, traffic and emissions. Business partners will supply and assist, municipalities will plan, governments will set the rules, and local enterprises and building owners will decide, which energy services they will access. Doing that, they will make profits, create jobs and incomes, improve their quality of life and get re-elected – or the opposite. Supplying buildings with energy and especially renewable energy will affect farmers, tourists, tenants, owners, technology providers and politicians. It is to their interest, that they should check the acceptance of their activities beforehand.

Benefits of such an acceptance driven approach will be:

- To develop and improve regionally accepted integrated applications of polygeneration in buildings,
- To find new clients, suppliers and partners for a local implementation and build up confidence and trust,
- To build up identification with the idea of renewable energy use in buildings and positively influence public opinion.

Socio-economic acceptance

Acceptance is the positive attitude of a client towards a product or service. Acceptance is on hand when needs are met, conflicts are sorted out, interests are balanced – and people get informed about this. The whole system must be considered. What does a local supply mean for the region, the municipality, the specific site? How does it affect existing and future supply chains? How will a farmer benefit maintaining his farm and upgrading his family income, when selling biogas? Which new and competitive projects could an eco-village

create, a local mayor or a regional manager could add to his references? Will a house-wife or a hotel technician be satisfied with the convenience of a sophisticated passive house architecture?

How can we make people wish to go to America?

Acceptance of polygeneration would not only mean to not oppose a new energy supply system, but to know it, to trust it, to desire it and to actively promote its dissemination. Kari Thunshelle, Norwegian partner within a European project bringing retrofit innovation to application in public buildings[1], therefore found it necessary to enter the mind of the decision maker when or before the decisions are made, to give him/her the information needed to understand the technologies and give arguments for why this is a good idea, to show that the solutions are possible and to give ideas and guidance on how to make it economically possible.[2]

Improve the service

Acceptance within the target group is one of the main preconditions to make a product idea successful. Research on acceptance contributes scientific tools to find out influence factors and barriers to acceptance. Acceptance evaluations aim at identification of those product features that influence predominantly clients' opinions and purchase patterns. As a consequence, a product or service may be further developed towards an optimal fit to clients' demands. The scope of an acceptance evaluation will focus on the customers' needs as well as on improvements the producer could introduce; improvements both to the product as well as to its setting. Results of such acceptance evaluation may be introduced directly into a better service and communication, and therefore yield additional sales.

3 main drivers for acceptance in polygeneration

That is a main reason, why acceptance evaluations have become wide-spread in the past few years. In fact, acceptance is an old sociological dimension, a classical topic in market research. New is, that acceptance now is not only attached to commercial products, but also to public goods, societal infrastructures and policy shifts. There are three main drivers behind that.

First, *the public becomes more aware* about public services and their performance. The civil society claims to participate in decisions about its concerns. People are ever better educated, they put pressure on the efficiency and flexibility in local and regional administration.

---

[1] Experience and results from EU FP6 Brita-in-PuBs project – Bringing retrofit innovation to application in public buildings. WP1: Real project planning and decision barriers, project needs and financial strategies.

[2] Kari Thunshelle: Eco-buildings in the context of socio-economic evaluation tools – or how to make people go to America? CAMELIA Symposium "Sustainable Energy Supply for Buildings – Ecological Potental and Socio-economic Acceptance" of EU-Coordination Action, Profactor, Steyr, 17/18 April 2006.

Second, we are witnessing a *major shift in technologies*. According to the German technology researcher Leo Nefiodow[3], these shifts bring forward technologies in clusters, finally occupying large shares of world gross value added and economic growth. The upcoming basic innovation cluster comprises biotechnology as well as nanotechnology, renewable energy[4], and human technologies like networking and psycho-social health promotion. These technologies would change institutions, industries and behavioural patterns (e.g. the shift from trains to automobiles in one of the last technology waves), and need huge investments – their acceptance becomes a societal issue.

Thirdly, *industry is infiltrating* national and European policies more and more. The notion of acceptance would serve as an instrument to support lobbies and pressure groups and to justify provincial governments' decisions accordingly. Exactly that hidden ambition is the crucial point of "acceptance of acceptance studies".

The acceptance of technology integration in a certain location is linked both to socio-economic technology impacts as to the communication about them. An assessment of acceptance will have to take into account not only real impacts, but also presumed impacts, expectations, subjective aspiration and apprehension.

Evaluation of acceptance

What would have been, if

In general terms, evaluations target at measuring the impact of an intervention, a project or policy. The question is, whether results are a consequence of the intervention, or whether the results would also have occurred, when the project or policy would not have been implemented. "The fundamental tenet of impact assessment is the need to compare the observed situation with the intervention to *what would have been* had there been no intervention at all."[5]

[3] Leo A. Nefiodow (2001): Der sechste Kondratieff, St.Augustin.

[4] BMW / IFMO study on acceptance of hydrogen in vehicles: Gundi Dinse (2003): Akzeptanz von wasserstoffbetriebenen Fahrzeugen, Institut für Mobilitätsforschung (IFMO), Berlin, 4. Aufl. 2003

[5] Eric Oldsman: Evaluating Business Assistance Programmes. Symposium "Evaluating local economic and employment development", OECD (LEED) Programme, EC DG Employment and Social Affairs, BMWA Wien, 20–21 Nov 2002

Non-observable facts in each evaluation

The difference in resulting outcomes between these two states constitutes the impact of the intervention – but it cannot be observed directly and thus needs deciding on assumptions and making judgements. Their appropriateness will constitute the quality of the evaluation. In natural science and engineering this issue is appropriately dealt with in experimental designs, changing single parameters and thus attaching effects to causes. In societal development such an experimental design generally is not available. The counterfactual is not observable.

We could compare the situation before and after, but that may be influenced by other factors, conditions, laws, actors. We could compare locations with and without the technology, and the same argument applies. We could survey people's opinions whether they verify the impacts, and interview experts – and we assume that they would know the impact and were willing to respond honestly. From a cognition point of view there is no way to get the real socio-economic impact of a technology implementation.

Evaluation may not be independent – and becomes a useful part of the system

As a consequence it is wise to allow a contextual approach to evaluations, as it is promoted e.g. in the discussion on evaluating employment development. Evaluation would be part of a learning system, making a region capable of self-correction, especially self-introduction of renewable energies. Socio-economic acceptance evaluation would not just make judgments, account for criteria and standards, but also be formative in improving implementation and empower people for regional energy business development. Having that goal in mind, it will be advantageous to get in touch with the stakeholder beforehand and agree on the evaluation method to be applied. Documenting these assumptions transparently, will definitely support the acceptance of a socio-economic evaluation.

Research is part of a 2-way communication

When evaluating acceptance, it must be assured, that information derived by that process is re-fed into societal communication. An acceptance study collecting individual opinions and entrepreneurial demands is a sort of communication, and will be a very powerful progress measure, when it is not a one-way communication but integrated in a process of regional, political and inter-sectoral bargaining and conflict resolution.

Evaluation of socio-economic acceptance would need methods that are both sensible to various stakeholder demands and are capable of contributing to a regional participation and mobilisation process. Criteria for selection of evaluation methods should comprise as well specific contents (e.g. does the method account for CO_2 reduced) as well as the methods' discoursivity i.e. its participatory potential.

2 Criteria for evaluation

33 dimensions of benefits

A literature research has been carried out in order to find out dimensions that are relevant to integration of polygeneration into buildings. The result has been a list of 33 such dimensions, some of them addressing economic, ecologic, political or social targets. Those dimensions build up a basic content framework of intended outcomes.

Evaluation should adapt to local needs

It should be notified, that there is no one set of dimensions that will fit all locally integrated projects for polygeneration in buildings. With that caution in mind, certain dimensions may be selected from the list being more relevant than others for a specific project. Other dimensions should be added to the set of relevant dimensions, covering the local contexts of an installation. Whether the list is comprehensive, finally will depend on a specific project and its regional context.

Survey instrument

A survey instrument has been constructed, to support regional decision makers in finding out which demands are most important, and which polygeneration systems are most interesting to their region. The scope of experts' questionnaire is to regional needs, to find out solutions for polygeneration integration. Regional decision makers find out which technologies would be preferred in their region

The survey instrument (see appendix) comprised 23 item groups, 17 of them categorized. It has been pre-tested within the CAMELIA team. Some of the results are documented in the next chapter. The following list describes the criteria, and gives some test results (in italics) pointing out, which of them have been regarded as important (within a test region), which of them might have been fulfilled (by preferred technologies). Applying the survey in real cases certainly will yield other preferences, and therefore other evaluation demands.

Business and economy criteria

Which of the dimensions are important?

The economy is an adaptive system designed for efficiently matching human needs. Economic criteria therefore account for benefits to enterprises and sectors, helping them to better fulfil demands. When such benefits exceed the scope of individual enterprises, i.e. when they affect sectors, regions, networks, they also become a political (or public) issue.

- **Regional Key Projects and Technologies.** Some regions are specialized in certain technologies. Introducing multigeneration energy systems could become an application of such technologies, further develop them or attract them as a key project. For example the Burgenland municipality Güssing introduced thermal gasification of biomass and feeds CHP heat into a local area heating network. A multigeneration application that would further support this key project and technology would rank high with respect to that indicator. *Test demand:* HIGH*, fulfilment:* HIGH

- **Support of Related Industries and Sectors.** Some regions focus on specific sectors. Introducing multigeneration energy systems could support these industries and sectors by fostering their infrastructure, or allowing these sectors to locally supply multigeneration energy systems. An example of this is agriculture, which could be stabilized when not only producing food but also energy crops. *Test demand:* HIGH*, fulfilment:* HIGH

- **Regional Trade Balance / Independent from Imports.** Using own resources for producing energy will decrease import necessities. Areas with a negative trade balance could even deal with some of their deficits. Independence from imports has shown up to become a motivating factor in periods of increasing oil prices and uncertainties in foreign relations. *Test demand:* HIGH*, fulfilment:* HIGH

- **Security of Supply / Risk Diversification.** Diversifying energy systems will also lower the risk of supply slumps and increase security of supply. It is obvious that such insurance services are available only at a price and a reasonable charge on electricity (or heat, cooling …) prices could be acceptable as customers are also used to pay for insurances. This indicator marks the trade-off between efficiency and stability of energy supply. *Test demand:* HIGH*, fulfilment:* HIGH

- **Establishment of a Regional Knowledge Base.** Knowledge is a key factor for the modern economy. Re-integrating the chain of energy supply into a region will increase its knowledge base. When implementing heat pumps, photo voltaic or heat storage, regional specialists and experts must be qualified to maintain and further develop that systems. The end-user will become an actor in energy supply, not just delegating decisions. *Test demand:* HIGH*, fulfilment:* HIGH

- **Regional Growth.** Multigeneration energy systems could contribute to regional growth, when they increase outputs and productivity, lower costs, attract incomes, enterprises and labour. Investment in building insulation e.g. would increase employment in the construction sector, and – later on – lower heating expenditures. *Test demand:* HIGH*, fulfilment:* MEDIUM

- **Export Potential.** A region with low own demands and high renewable resources could increase its export potentials. That is valid e.g. for sparsely populated or uninhabited areas with extensive forestry or agricultural land use, for wind exposed locations or sunny Mediterranean sites. Export potentials will depend also on transport feasibility, energy densities, energy storage. In many cases, proximity of energy supply and demand is inevitable, reducing export potentials and even leading to social conflicts on site. *Test demand:* HIGH*, fulfilment:* MEDIUM

- **Enhanced Competitiveness of Enterprises.** This effect characterizes the supply side and relates to changes in productivity, investment in resources, employees' qualification and flexibility, inward and outward co-operation and networking. A multigeneration project including many suppliers of energy crops could increase competitiveness, when co-operation structures are established that would generate also other incomes, e.g. in farmers' direct food marketing. *Test demand:* HIGH*, fulfilment:* MEDIUM

- **Improved Infrastructure.** Creating infrastructures like a local area heating or cooling network could increase the efficiency of individual energy supply in buildings. *Test demand:* HIGH*, fulfilment:* MEDIUM

- **Diversification.** Introducing new technologies in energy supply to buildings will diversify regional services, e.g. plumbers will qualify to install heat-pumps, ventilation, solar panels; architects will specialize on solar and climate optimization; building owners will

demand new services in construction and energy consultancy. *Test demand:* HIGH*, fulfilment:* MEDIUM

- **Income Creation.** When using local resources, incomes will be created within the chain from resources to final services. These incomes include enterprises' returns as well as employees' earnings. Incomes correspond to value added and as well to induced employment. The primary sector profits, when agricultural or forestry resources are used; services and industry will increase their incomes, when new cooling, heating or power generation is integrated into buildings. *Test demand:* HIGH*, fulfilment:* MEDIUM

- **Increased Productivity.** Productivity reflects the additional value generated through the use of capital, labour, material and other factors of production. Heating networks e.g. may increase their productivity, when more households connect to the grid; municipal waste water treatment plants may do so, when they could sell sewage gas, or even better heat and power. Measurements of productivity are often restricted to output per employee, an indicator not reflecting increased outsourcing, but being relative simply to obtain necessary data. *Test demand:* HIGH*, fulfilment:* MEDIUM

- **Induced Investment.** Investment is induced on the one hand by establishing multigeneration systems, on the other hand also by the supply chain; e.g. the hotel will invest in an absorption air conditioning system, and the technical firm will invest in repairing equipment. *Test demand:* MEDIUM*, fulfilment:* MEDIUM

Ecology and environmental criteria

Even from an anthropocentric perspective, the preservation of ecology and environmental capital may be a beneficiary: as a future resource for up-following generations, and as a resource for human recreation and health. Thus, ecology and environmental criteria bear many social and economic aspects.

- **Sustainable Use of Renewable Resources.** A sustainable use of renewable resources would mean a design dimensioned for long-term feasibility. Multigeneration systems could make use of renewable resources (like wood-chips) in a sustainable way, when gathering not more wood from forests than will grow again. *Test demand:* HIGH*, fulfilment:* HIGH

- **Air Quality.** An outcome of using renewable resources and preservation of non-renewables is the reduction of CO_2-emissions, a major issue of air pollution. Air quality is an issue that also comprises reduction of other contaminants, and thus is not a single indicator but more a set of them. Wood, wood chips and pellets e.g. could be renewable resources that even increase dust emissions. Bad odour in the near surroundings of a biogas plant reduces air quality. *Test demand:* HIGH*, fulfilment:* HIGH

- **Noise Reduction.** Offices, dwelling areas, recreational areas like tourist resorts or hospitals must avoid noise emissions. Exchanging a gas motor by a stationary fuel cell for a power back-up system in a hospital would reduce noise emissions. Traffic induced by material transport to a CHP plant on the other hand would increase noise at the spot and possibly cause neighbour protests. *Test demand:* HIGH*, fulfilment:* MEDIUM

- **Landscape Amenities.** Local integration of polygeneration applications need decentralised installation and construction. Whether a CHP plant beautifies a landscape or not, will depend on the architect as well as individual taste. On the other hand wind turbines may not appeal to the tastes of many, and even defy the architects, when not re-designing traditional Dutch windmills. Micro wind turbines on houses, as proposed and already provided by a UK entrepreneur[6], would therefore cause a thorough bargaining

[6] Tony Gordon, Building Integrated Wind, Windsave Ltd., Presentation at CAMELIA Symposium, University of Ulster, Belfast, 13. Jan. 2006.

with municipal public authorities, when applied in dense settled areas. *Test demand:* HIGH*, fulfilment:* LOW

- **Transport and Traffic Reduced.** When changing the energy supply system, traffic flows will change as a consequence. A local integration could reduce traffic under a global perspective, but increase it locally. This could result in a mixed blessing, when the global advantage could not subjectively outweigh the local inconvenience. *Test demand:* HIGH*, fulfilment:* LOW

- **Preservation of Non-Renewable Resources.** Non-renewable resources will be preserved either by abstaining from them or by substitution with renewable ones. Multigeneration systems could make use of renewable resources (like biogas) as well as non-renewables (like natural gas). *Test demand:* MEDIUM*, fulfilment:* HIGH

- **Biodiversity.** Biodiversity is often attached to a diversity in land use. Thus, a wood based multigeneration for buildings in forestry intense areas would contribute to biodiversity, when aisles and glades would create a mix in forestry monocultures. *Test demand:* MEDIUM*, fulfilment:* HIGH

- **Water Quality.** A clean industrial production as well as a sustainable agriculture and waste treatments are crucial to water quality. *Test demand:* MEDIUM*, fulfilment:* MEDIUM

- **Preservation of Soil Quality.** A sustainable land use, especially in farming, is crucial to soil quality. Fertilising land with manure from animal husbandry would take care of soil quality, when the manure had been fermented previously by processing it through an anaerobe digestion. *Test demand:* MEDIUM*, fulfilment:* MEDIUM

Social and immaterial criteria

Social and immaterial criteria affect and characterize the area of human life. Individual and collective life styles, preferences and values, are the driving forces in this area. The needs for social relations and acceptance, self realisation, security and basic supplies constitute that area, even when some of their fulfilments are released to the economy and the political system.

- **Increased Employment and Job Supply.** Employment lets people participate in the economy, giving them access to goods and services. When using local resources, employment will be created within the chain from resources to final services. Employment corresponds to gross production and as well to value added. The primary sector profits, when agricultural or forestry resources are used, even more than services and industry, as the productivity in the primary production in general is lower than in the secondary or tertiary sector. *Test demand:* HIGH*, fulfilment:* MEDIUM

- **Health promotion.** A sound environment and standards of living will promote individual health. With respect to use of resources, many of the arguments for "ecology and environment" also apply for human health. For applications of multigeneration in buildings, the functions and features of buildings will especially affect human well-being – and maybe conflicting with energy saving issues, e.g. being allowed to open windows in passive houses. *Test demand:* HIGH*, fulfilment:* MEDIUM

- **Support of Regional Pioneers.** Implementation of local applications of polygeneration will need regional first movers, acting as pioneers of application and promotion. *Test demand:* HIGH*, fulfilment:* MEDIUM

- **Education and Qualification.** Knowledge and know-how constitute main factors for self-esteem and flexibility, individual education and qualification generally correlates with wage levels. *Test demand:* HIGH*, fulfilment:* MEDIUM

- **Preservation of Building Substance and Ambience.** They constitute factors for an increased standard of living. *Test demand:* HIGH*, fulfilment:* MEDIUM

- **Integration and Employment of Weak Target Groups.** Energy policies may interrelate with employment policies. The supply

chain from local resources to energy services may include not only high qualified, but also less qualified jobs (e.g. in agriculture). *Test demand:* HIGH*, fulfilment:* LOW

- **Feel comfortably.** Providing the most individual benefit can be an achievement of a multigeneration system. *Test demand:* MEDIUM*, fulfilment:* HIGH

- **Conformity with Regional Development Vision.** This factor attaches the individual priorities for their region and their conformity with polygeneration. When goals towards sustainable energy use harmonize, difficulties in realization may be overcome more easily. *Test demand:* MEDIUM*, fulfilment:* HIGH

- **Development of a Culture of Cooperation & Participation.** As polygeneration may attach many actors, sectors and industries in a region, a culture of participation is a promoting factor. And vice-versa: a specific polygeneration project can be used as an occasion to further improve and give substance to networks and co-operations. *Test demand:* MEDIUM*, fulfilment:* MEDIUM

- **Mitigating Rural Depopulation and Over-Ageing.** A regional balanced development is a target of social cohesion and stability. Tying energy supply to local multigeneration will decentralise economic activities and rise opportunities for weak regions. *Test demand:* MEDIUM*, fulfilment:* MEDIUM

- **Less Poverty.** Energy policies may interrelate with social policies. The supply chain from local resources to energy services may create jobs and incomes accessible for the poor and unqualified. *Test demand:* MEDIUM*, fulfilment:* LOW

3 Experts' survey on demands for evaluation

Pre-testing the survey

A survey has been carried out, targeting energy experts, sampling CAMELIA project partners, supplemented by technical students of the University of Aachen in Germany. 13 questionnaires suitable for evaluation have been remitted. The questionnaires were in paper form, being personally delivered and collected, by fax and via e-mail. The survey was carried out in July and August 2005. Most of the respondents had a background in engineering, only two of them in business, economy, financial services or public authorities. 62 % have been working in the field of bio-energy for up to five years, 38 % for even more. The sample is strongly gender biased: only 1 respondent has been female – a typical quota for engineering samples.

Choose a region

The respondents were asked to choose a region, well-known to them, where they would suggest to apply and to integrate multi-generation energy systems. Within that region they ought to fix a place of a special application, e.g. a district of a city. The respondents chose urban areas as well as rural. Most of the sites were European, some of them in southern, others in central Europe. Due to the structure of the sample, 5 have been in Germany.

Choose a scenario

These regions were the location of a specific scenario. Two alternative scenarios were available: SCENARIO 1: In the year 2020 *energy for buildings will be provided 25 % by Renewable local resources.* SCENARIO 2: In the year 2020 *energy consumption in buildings will be dropped by 50 % per square meter and year.* For most of the respondents these scenarios have been ambitious and courageous as well as attractive and desirable, at least to some extent. But these scenarios sometimes do not describe a realistic and attainable future state. For SCENARIO 1 only 23 % believe in its attainability, for SCENARIO 2 these are 46 %. 62 % believed totally, that SCENARIO 2 would be attractive and desirable. Nevertheless, asked to choose one of the scenarios above for further consideration, the majority of two thirds chose SCENARIO 1: providing buildings 25 % by Renewable local resources.

Tangible building types had to be considered for the issue of implementation. For most of the respondents, these buildings were schools, universities or one-family-houses. For one third of the respondents, buildings with 20 and more dwelling units and tourism, recreational resorts, swimming-baths as well were building types

they wanted to consider. A fourth of the respondents also would propose supermarkets, shopping centres, storehouses, or bureaus, private or public administration.

It is interesting that high density and industrial sites were not chosen frequently, only a few respondents proposed buildings with up to 20 dwelling units, old city centres, urban high density residential quarters, urban business quarters, hospitals – none at all claimed for industrial production buildings.

Scenarios

Please consider the following scenarios for your region. SCENARIO 1: In the year 2020 energy for buildings will be provided 25% by Renewable local resources.						
Do you think this scenario is ...	no answer	Yes, totally	Yes, to some extent	probably not	Definitely no	score
ambitious and courageous	*15 %*	*38 %*	*46 %*	*0 %*	*0 %*	*82*
attractive and desirable	*15 %*	*46 %*	*31 %*	*8 %*	*0 %*	*82*
realistic and describes an attainable future state	*0 %*	*23 %*	*0 %*	*62 %*	*15 %*	*44*
SCENARIO 2: In the year 2020 energy consumption in buildings will be dropped by 50% per square meter and year. Do you think this scenario is **...**						
attractive and desirable	*23 %*	*62 %*	*15 %*	*0 %*	*0 %*	*93*
ambitious and courageous	*15 %*	*31 %*	*46 %*	*8 %*	*0 %*	*76*
realistic and describes an attainable future state	*15 %*	*8 %*	*38 %*	*23 %*	*15 %*	*48*

Building types

Which of the following building types would you consider to be most appropriate for realizing that scenario?			
schools, universities	*62 %*	buildings with up to 20 dwelling units	*15 %*
one-family houses	*54 %*	old city centres	*15 %*
buildings with 20 and more dwelling units	*31 %*	urban high density residential quarters	*15 %*
tourism, recreational resorts, swimming-baths	*31 %*	urban business quarters	*8 %*
supermarkets, shopping centres, storehouses	*23 %*	Other : Hospitals	*8 %*
bureaus, private or public administration	*23 %*	industrial production buildings	*0 %*

CAMELIA-experts' questionnaire, pre-test sample n=13

STUDIA

Many ressources

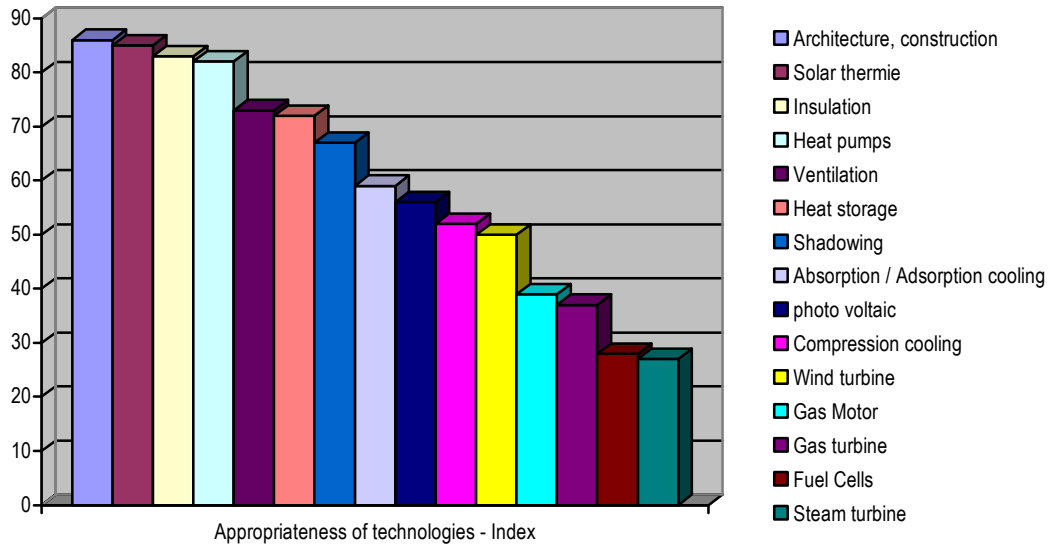
The main local renewable resources will be solar: Half of the respondents totally agree with this statement, and another half would regard this true to some extent. The second favourite is wind. Wood (chips and pellets) and agricultural biogas range ex aequo at the third place. To some extent straw, peat, bark or other organic wastes, landfill or sewage gas, and geothermie will be an efficient and extensive local source, but reformed gas, pyrolysis gas, hydropower and waves will seldom be a feasible option.

Many technologies

Quite a range of technologies seem to be most appropriate for achieving this scenario. Highest feasibility is achieved by solar and climate optimized architecture and construction, as well as related passive technologies like insulation and shadowing, as well as logistics like ventilation, heat storage and specific distribution technology.

When it comes to specific sources of energy the favourites are installation of solar panels, heat pumps and absorption / adsorption cooling. Photo voltaic, compression cooling, wind turbines would be considered sometimes, but gas motors and turbines as well as fuel cells and steam turbines would frequently be not an appropriate option.

Favourite Technologies

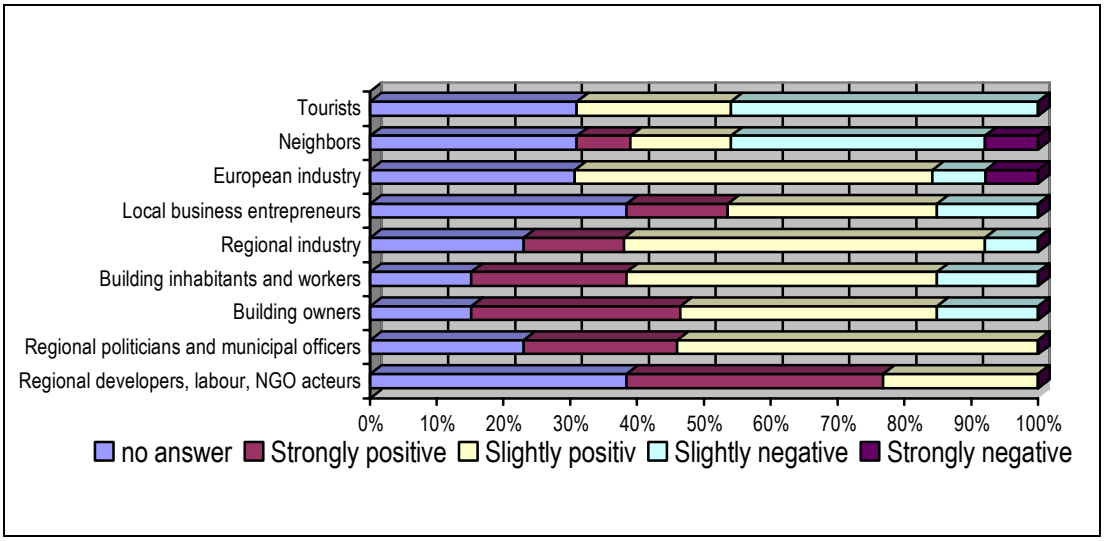


CAMELIA-experts' questionnaire, pre-test sample n=13

People affected

Technologies need persons who promote them. It has been important to know, which persons, person groups and organizations are affected by the scenarios and the most favourite technologies. The opinion of people affected will be most crucial to acceptance or non-acceptance of a technology. Both, positive and negative issues have to be regarded.

Stakeholders affected



CAMELIA-experts' questionnaire, pre-test sample n=13

Analysing different target groups, most of the scenario effects are considered to be positive. Purely positively affected will be the group of regional developers, labour, environment NGO actors as well as regional politicians and municipal officers. They therefore should be most efficient in promoting local renewable energies and related technologies. Building owners and building inhabitants and workers will also be affected positively, but some slightly negative effects will also have to be considered. The same applies to regional and European industry and local business entrepreneurs: they will belong to the winners of that technology shift too. A crucial factor may be neighbours and tourists. The respondents do not expect any strong effects, neither positive nor negative ones. As slightly negative effects will outweigh the others, it will necessary to consider special measures in order to let them participate from benefits joined with the proposed technology shifts.

It is expected that most sectors will have added value effects or occupational effects. Clear winners will be technical equipment and service providers, plant engineering and construction. The technology shift will support definitely also the building sector, financial intermediaries, banks, investors as well as teachers, researchers, con-

sultants; transportation and storage provider and agriculture, forestry, fishing. – For municipal services: sewage and refuse disposal, real estate and renting, electricity, gas and water suppliers there will be both advantages and disadvantages.

A preliminary ranking of dimensions

One of the results of the preparatory study has been a set of dimensions, and a ranking of these dimensions according to their regional relevance and technology fulfilment.

There are some effects that will very clearly be promoted from the scenario and the related technologies. 33 effects have been studied. The most virulent effects ranked in their order of predominance are (1) Sustainable Use of Renewable, (2) Preservation of Non-Renewable Resources, (3) Air Quality, (4) Establishment of a Regional Knowledge Base, (5) Regional Key Projects and Technologies.

A sustainable use of renewable energy sources and preservation of non-renewable resources will certainly establish a high value for many users. Sustainability values may be high, but they might become discounted as it often occurs, when future benefits are paid present-day. The third issue, air quality, could carry the idea of sustainability more touchable. The fourth and the fifth benefit both start off from a non-material base: knowledge and know-how that is the base for technology and their integration. A regional key project will surely use these immaterial factors to create jobs and incomes, but the question arises, if this relationship is transparent to the customer.

Most important for pre-tested respondents

More generally, we will have to ask whether these fulfilments will meet regional demands. With all the 33 aspects, we posed the question, which kind of effects is important to the respondent's region. That question resulted in a score of regional demands. The most important effects, a region will demand, ranked in their order of predominance are:

(1) Air Quality,

(2) Education and Qualification,

(3) Support of Related Industries and Sectors,

(4) Sustainable Use of Renewable Resources,

(5) Increased Employment and Job Supply.

We notice that items 1 and 4 already show up in the list of most dominant technology effects. Technology seems to fulfil these customer demands with respect to sustainability – yet a more detailed analysis will have to survey regional stakeholder and key target

groups other than technology experts to guarantee an appropriate view of regional demands. Item 2 attaches again a non-material value: education and qualification. Items 3 and 5 show very clear, that a region will highly prioritise its own industries and sectors and the employment created therein.

Here, technology features do not correspond very much with regional demands. Within a test, covering various regions and technologies, this does not surprise. The scores of technology fulfilments and regional demands correlate only r=0.173 (n=33). The effects appear as a cloud in the two-dimensional space of demands and fulfilments. If technology would be adjusted to demands, this picture would present us a straight line, or at least an up-bound ellipse, containing most of the points. In a real case application, that correlation should increase much, in order to guarantee a high customer satisfaction.

4 Methods of socio-economic evaluation

Quality standards for evaluation

As it has been depicted out, the evaluation should be integrated into a participatory decision making process. Well accepted evaluation standards, presented by the German Evaluation Society[7] or the US-American "Joint Committee on Standards for Educational Evaluation", argue e.g.

(a) to identify stakeholders so that their interests can be clarified and taken into consideration when designing the evaluation,

(b) to clarify the purposes of the evaluation so that stakeholders can provide relevant comments,

(c) disclosure findings to the extent possible.

Evaluation should – most important – consider those dimensions that are relevant. The experts' questionnaire above delivers a tool to acquire a ranking of these dimensions in each individual case. The decision, which dimensions to consider and how to weigh them, will be eased, when stakeholders are involved in prioritising them. Which dimensions could be relevant, has been described above. The method should be comprehensive with regard to the dimensions needed. Other, inbound features are, that methods should take into account indicators that are valid, reliable and practical.

- **Relevance.** Measures selected for the evaluation need to be adequate and important to the particular polygeneration system being studied.
- **Comprehensiveness.** The system of indicators should be comprehensive, comprising all relevant dimensions, and should balance them according to their relevance. An indicator for comprehensiveness has been built counting the number of criteria the method evaluates
- **Discoursivity.** Results of the evaluation should be integratable into a learning process. Stakeholders (and not only the evaluators) are involved in specifying criteria and indicators as well as evaluative judgements.

[7] english summary (pp 47–50) in: Deutsche Gesellschaft für Evaluation (DeGEval), Standards für Evaluation, Köln 2002, ISBN 3-00-009022-3.

- **Validity.** Measures need to provide an accurate reflection of the underlying feature that is supposed to be measured.
- **Reliability.** Measures should be subject to as little measurement error as possible.
- **Practicability.** Data needed to calculate measures must be available, procedures transparent and cost-efficient. The relationship between cost and benefit of the evaluation should be appropriate.

Surveyed evaluation demands

Ex ante and after 5 years of operation

Within CAMELIA project partnership, evaluation methods for socio-economic acceptance have been discussed. It was generally agreed that projects and measures should be evaluated in order to control scenario realization. They should be evaluated ex ante, before starting a project, in order to be able to adapt them to regional demands.

Furthermore, an ex post evaluation after five years of operation seems very important to the majority of the respondents of the experts' questionnaire. To most of the respondents, quantitative methods and especially life cycle analysis of environmental effects are important.

Evaluation methods rather unknown

Generally, other methods of evaluation seem to be rather unknown. This applies e.g. to input-output analysis calculating value added and employment effects, as well as to qualitative methods, contingent valuation of subjective readiness to pay or the hedonic price method.

With respect to economic effects, cost-benefit and opportunity cost analysis had some priority. These methods are also capable for comparing with competitive investments and for making intangible effects visible.

Support politicians

We therefore suggest, to support politicians as well technicians in access to such methods. Another consequence, directly related to the scope of CAMELIA, suggests choosing evaluation tools depending on customer demands, using the created experts' questionnaire in specific case studies (WP 7).

Evaluation tools and concepts

Within CAMELIA, we surveyed a set of 10 evaluation tools, addressing socio-economic acceptance and capable for applications concerning polygeneration.

Evaluation tools and socio-economic acceptance criteria - overview

Method	Criteria	Material flow analysis	Balance of exergy	Balance of energy	Interviews and questionnaire	Life cycle assessment	Externalities	Quality Function Deployment	P.E.S.T. Analysis	Regionalized Input-Output Analysis	General Equilibrium Model	Development Impact Analysis	SUM
Business and economy impacts	Establish a Regional Knowledge Base				x			x	x				2
	Regional Key Projects and Technologies				(x)		x	x	x	x			4
	Support of Related Industries and Sectors							x	x	x	x		3
	Regional Trade Balance / Indep. from Import					x		x	x	x			3
	Security of Supply / Risk Diversification				(x)			x	x			x	3
	Regional Growth				x			x	x	x		x	4
	Export Potential							x	x		x		2
	Enhanced Competitiveness of Enterprises							x	x		x		2
	Improved Infrastructure							x	x	x		x	3
	Diversification						x	x	x	x	x		4
	Pay-back time, return on investments					x		x	x				2
	Income Creation				x			x	x	x	x	x	5
	Increased Productivity			x		x		x	x				3
	Induced Investment							x	x	x	x		3
Ecology and environmental impacts	Sustainable Use of Renewable Resources		x	x	x	x		x	x			x	6
	Air Quality	x			x	x	x	x	x			x	6
	Noise Reduction / Protection				x		x	x	x			x	4
	Climatic Change	x			x	x	x	x	x			x	6
	Landscape Amenities							x	x			x	2
	Transport and Traffic Reduced				x		x	x	x			x	4
	Preservation of Non-Renewable Resources		x		x			x	x			x	4
	Land usage and housing availability				(x)			x	x			x	3
	Biodiversity						x	x	x			x	3
	Water Quality	x					x	x	x			x	4
	Preservation of Soil Quality						x	x	x			x	3
Social and immaterial impacts	Increased Employment and Job Supply				x		x	x	x			x	4
	Health promotion				x	x	x	x	x			x	5
	Support of Regional Pioneers				x	x	x	x	x				4
	Education and Qualification				(x)			x	x			x	3
	Preserve Building Substance and ambiente					x	x	x	x			x	4
	Integrate / Employ Weak Target Groups				x	x	x	x	x	x		x	6
	Feel comfortably, Quality of Life				x	x	x	x	x			x	5
	Conform with Regional Development Vision	x			x	x	x	x	x	x		x	7
	Culture of Cooperation and Participation				x	x		x	x			x	4
	Mitigating Rural Depopulation / Over-Ageing				x			x	x			x	3
	Less Poverty							x	x			x	2
COMPREHENSIVENESS	number of criteria evaluable	4	2	2	21	13	16	36	36	10	6	25	
DISCOURSIVITY	participatory potential	1	1	1	4	2	2	3	1	3	1	1	

STUDIA

Material flow analysis

Name of the method	**Material flow analysis**			
Focus	Ecology and environmental impacts			
Technical description				
Using Material Flow Analysis (MFA), engineers and planners can determine the main sources, flows, stocks, and emissions of man-made and natural materials. Assessment of materials and energy related environmental impacts based on systems analysis; derivation of indicators for sustainability e.g. of materials intensity per service unit (MIPS),				
Criteria addressed				
Business and economy impacts	Ecology and environmental impacts		Social and immaterial impacts	
	Air Quality, Climatic Change, Water Quality		Conform with Regional Development Vision	
Applicability	Ex ante	yes	Ex post	yes
References				
Energy crops: http://www.biogasakzeptanz.at; General: http://www.wupperinst.org				
Strengths		Weaknesses		
Attaches energy supply to regional potentials Capable to find out bottlenecks in regional supplies of renewable resources (availability)		Indicators like materials intensity per service unit (MIPS) did not really become accepted		

Balance of exergy

Name of the method	**Balance of exergy**			
Focus	Ecology and environmental impacts			
Technical description				
The balance of exergy relates to the second. fundamental theorem of thermo-dynamics: Closed systems will increase their disorder (entropy), when converting energy. Entropy never decreases. Thermal energy reflects low entropy. When providing energy services, they should contribute as less as possible to entropy creation. Using industrial waste heat as an input e.g. would be preferable to an oil-fired building central heating				
Criteria addressed				
Business and economy impacts	Ecology and environmental impacts		Social and immaterial impacts	
	Sustainable Use of Renewable Resources, Preservation of Non-Renewable Resources			
Applicability	Ex ante	Yes, preferred	Ex post	Yes
References				
Strengths		Weaknesses		
Differentiates the quality of conversion and value of fuel; characterizes sustainability		In practice, it must be supplemented by other indicators Lack of demonstrativeness to non-technicians		

Balance of energy

Name of the method	**Balance of energy**			
Focus	Ecology and environmental impacts			
Technical description				
The balance of energy compares energy inputs to energy outcomes, and reflects productivity. The balance answers the question, how much energy must be put in in order to achieve the benefit expected. The concept behind relates to the first fundamental theorem of thermo-dynamics, stating that energy will prevail in a closed system.				
Criteria addressed				
Business and economy impacts	Ecology and environmental impacts		Social and immaterial impacts	
Increased Productivity	Sustainable Use of Renewable Resources			
Applicability	Ex ante	Yes, preferred	Ex post	yes
References				
Strengths		Weaknesses		
A basic, relevant and practical indicator, transparent in communication		In practice, it must be supplemented by other indicators		

Interviews and questionnaires

Name of the method	**Interviews and questionnaires**			
Focus	Social and immaterial impacts			
Technical description				
Socio-economic effects can best be evaluated by means of interviews and questionnaires				
Criteria addressed				
Business and economy impacts	Ecology and environmental impacts		Social and immaterial impacts	
Establish a Regional Knowledge Base, Regional Key Projects and Technologies, Security of Supply / Risk Diversification, Regional Growth, Income Creation	Sustainable Use of Renewable Resources, Air Quality, Noise Reduction / Protection, Climatic Change, Transport and Traffic Reduced, Preservation of Non-Renewable Resources, Land usage and housing availability		Increased Employment and Job Supply, Health promotion, Support of Regional Pioneers, Education and Qualification, Integrate / Employ Weak Target Groups, Feel comfortably, Quality of Life, Conform with Regional Development Vision, Culture of Cooperation and Participation, Mitigating Rural Depopulation / Over-Ageing	
Applicability	Ex ante	yes	Ex post	yes
References				
BIOPROM, CAMELIA http://www.biogasakzeptanz.at				
Strengths		Weaknesses		
Capable to assess multiple effects on acceptance and motivation of stakeholders Capable to cover a holistic approach Integrating stakeholders from the very beginning		Experts' interviews are time and resources consuming, especially when conducted face-to-face Strengths of causal inference and complexity capability are low Susceptible to subjective rating and strategic answering		

Life cycle assessment

Name of the method	**Life cycle assessment**			
Focus	Ecology and environmental impacts			
Technical description				
Life Cycle Assessment (LCA) is a tool used to evaluate the potential environmental impact of a product, process or activity throughout its entire life cycle by quantifying the use of resources ("inputs" such as energy, raw materials, water) and environmental emissions ("outputs" to air, water and soil) associated with the system that is being evaluated.				
Criteria addressed				
Business and economy impacts	Ecology and environmental impacts		Social and immaterial impacts	
Regional Trade Balance / Indep. from Import, Pay-back time, return on investments, Increased Productivity	Sustainable Use of Renewable Resources, Air Quality, Climatic Change		Health promotion, Support of Regional Pioneers, Preserve Building Substance and ambience, Integrate / Employ Weak Target Groups, Feel comfortably, Quality of Life, Conform with Regional Development Vision, Culture of Cooperation and Participation	
Applicability	Ex ante	yes	Ex post	yes
References				
BALANCE (IER), GEMIS, Öko-Institut				
Strengths		Weaknesses		
Life Cycle Assessment is an appropriate means to assess environmental effects; GEMIS includes already a lot of process chains LCA provides a common and transparent data base.		Generally, a lot of work and resources are needed.		

Externalities / Software EcoSense

Name of the method	**Externalities Software EcoSense**			
Focus	Social and immaterial impacts			
Technical description				
Externality analysis tool EcoSense is an instrument to assess external environmental effects and the impacts on environment, health and social aspects				
Criteria addressed				
Business and economy impacts	Ecology and environmental impacts		Social and immaterial impacts	
Regional Key Projects and Technologies, Diversification	Air Quality, Noise Reduction / Protection, Climatic Change, Transport and Traffic Reduced, Biodiversity, Water Quality, Preservation of Soil Quality		Increased Employment and Job Supply, Health promotion, Support of Regional Pioneers, Preserve Building Substance and ambience, Integrate / Employ Weak Target Groups, Feel comfortably, Quality of Life, Conform with Regional Development Vision	
Applicability	Ex ante	yes	Ex post	yes
References				
http://www.ier.uni-stuttgart.de/forschung/projekt_de.php?pid=270				
Strengths		Weaknesses		
EcoSense provides a common and transparent data base.		A lot of work and human and computing resources are needed.		

Quality Function Deployment

Name of the method	**Quality Function Deployment**			
Focus	Comprehensive			
Technical description				
QFD is a comprehensive method for quality design. It surveys customer needs from observations, uncovers quality features from a customer perspective, translates these into designs characteristics and deliverable actions, and builds and delivers a quality product or service by focusing the various business functions toward achieving customer satisfaction				
Criteria addressed				
Business and economy impacts	Ecology and environmental impacts		Social and immaterial impacts	
Potentially all	Potentially all		Potentially all	
Applicability	Ex ante	yes	Ex post	In part
References				
Locating optimal sites for biogas plants EU FP4 HOORAY Biogas in stationary fuel cells: EU FP5 EFFECTIVE (http://www.biomatnet.org/secure/FP5/S1565.htm) Baaske, Trogisch (ed.): Biogas Powered Fuel Cells, Trauner, Linz, 2005, ISBN 3-85487-626-2 In general: http://www.qfdi.org				
Strengths		Weaknesses		
Orients integration of technologies, product and service development to an optimal matching with customer and stakeholder demands		Is not a measurement by itself but an aggregate – needs supplementary data, questionnaires, interviews, site visits		

P.E.S.T. Analysis

<table>
<tr><td>Name of the method</td><td colspan="4">P.E.S.T. Analysis</td></tr>
<tr><td>Focus</td><td colspan="4">Comprehensive</td></tr>
<tr><td colspan="5">Technical description</td></tr>
<tr><td colspan="5">The method considers, what environmental influences have been particularly important in the past, and the extent to which there are changes occurring which may make any of these more or less significant in the future. It provides an analytical framework with a checklist of important environmental forces. These forces are divided into political, economic, social and technological factors (P.E.S.T.) which shape the business environment of the emerging industry.</td></tr>
<tr><td colspan="5">Criteria addressed</td></tr>
<tr><td>Business and economy impacts</td><td colspan="2">Ecology and environmental impacts</td><td colspan="2">Social and immaterial impacts</td></tr>
<tr><td>POTENTIALLY: Establish a Regional Knowledge Base, Regional Key Projects and Technologies, Support of Related Industries and Sectors, Regional Trade Balance / Indep. from Import, Security of Supply / Risk Diversification, Regional Growth, Export Potential, Enhanced Competitiveness of Enterprises, Improved Infrastructure, Diversification, Payback time, return on investments, Income Creation, Increased Productivity, Induced Investment</td><td colspan="2">POTENTIALLY: Sustainable Use of Renewable Resources, Air Quality, Noise Reduction / Protection, Climatic Change, Landscape Amenities, Transport and Traffic Reduced, Preservation of Non-Renewable Resources, Land usage and housing availability, Biodiversity, Water Quality, Preservation of Soil Quality</td><td colspan="2">POTENTIALLY: Increased Employment and Job Supply, Health promotion, Support of Regional Pioneers, Education and Qualification, Preserve Building Substance and ambience, Integrate / Employ Weak Target Groups, Feel comfortably, Quality of Life, Conform with Regional Development Vision, Culture of Cooperation and Participation, Mitigating Rural Depopulation / Over-Ageing, Less Poverty</td></tr>
<tr><td>Applicability</td><td>Ex ante</td><td>yes</td><td>Ex post</td><td>yes</td></tr>
<tr><td colspan="5">References</td></tr>
<tr><td colspan="5">Volker Jaensch, Marketability analysis for an innovative fuel cell / biogas technology in Spain, South bank university, London, 2000.</td></tr>
<tr><td colspan="2">Strengths</td><td colspan="3">Weaknesses</td></tr>
<tr><td colspan="2">Holistic approach, national economy oriented</td><td colspan="3">A qualitative method needing supplementing interviews and reasoning
Not feasible to single sites</td></tr>
</table>

Regionalized Input-Output Analysis

Name of the method	**Regionalized Input-Output Analysis**			
Focus	Business and economy impacts			
Technical description				
Input-output analysis is one of a set of related methods which show how the parts of a system are affected by a change in one part of that system. Input-output analysis specifically shows how industries are linked together through supplying inputs for the output of an economy. Output refers to gross production, or total sales. One of the main problems with calculating regional input-output tables in this way is the overestimation of local economic activity.				
Criteria addressed				
Business and economy impacts	Ecology and environmental impacts		Social and immaterial impacts	
Regional Key Projects and Technologies, Support of Related Industries and Sectors, Regional Trade Balance / Indep. from Import, Regional Growth, Improved Infrastructure, Diversification, Income Creation, Induced Investment			Integrate / Employ Weak Target Groups, Conform with Regional Development Vision	
Applicability	Ex ante	yes	Ex post	yes
References				
Renewable Energy Studies: Greisberger, Hasenhüttl, Beschäftigung und Erneuerbare Energieträger, BMVIT, Wien 2002. Regionalisation techniques: http://www.owp.nl				
Strengths		Weaknesses		
Well known method Wide-spread applicated for energy technologies Yields demonstrative figures for employment and incomes Efforts may be low		Assuming fixed economic relationships Static in nature Limited to the economy, provides no tools for an interaction between population and economic changes		

General Equilibrium Model

Name of the method	**General Equilibrium Model**			
Focus	Business and economy impacts			
Technical description				
Dynamic economic model for prognosis of effects of a technology integration				
Criteria addressed				
Business and economy impacts	Ecology and environmental impacts		Social and immaterial impacts	
Support of Related Industries and Sectors, Export Potential, Enhanced Competitiveness of Enterprises, Diversification, Income Creation, Induced Investment				
Applicability	Ex ante	yes	Ex post	yes
References				
WIFO Wirtschaftsforschungsinstitut				
Strengths		Weaknesses		
Capable to integrate price shifts in course of a technology dissemination More realistic than Input-Output-Model		Very labour extensive Non-transparent Difficult to regionalize		

5 Appendix

Experts' questionnaire

CAMELIA Workpackage 6 — Bioenergy Expert Questionnaire vs.1.0

Acceptable building supply with local renewables

Provide the best methodologies for evaluation of socio-economic acceptance
Overcome crucial hindrances in sustainable power, heat and climate provision

General Information

1. What is your branch and your function in Bioenergy activities

Branch / Sector (More than one is possible)
- ☐ Agriculture
- ☐ Forestry
- ☐ Timber industry
- ☐ Waste management
- ☐ Engineering
- ☐ Logistics
- ☐ Environment / Ecology
- ☐ Economy / Financial
- ☐ Public Authority
- ☐ Association
- ☐ Others: ……

Function (More than one is possible)
- ☐ Planner / technical designer
- ☐ Producer / farmer
- ☐ Private citizen
- ☐ Plant operator
- ☐ Manager
- ☐ Advisor / consultant
- ☐ Scientist
- ☐ Others: ……

2. How long have you personally been active in the field of Bioenergy?
- ☐ Up to 5 years
- ☐ 5 years and more

3. Your gender
- ☐ male
- ☐ female

Region

4. Please choose a region, well-known to you, where you would suggest to apply and to integrate multigeneration energy systems

Region
i.e. Tyrol, Île de France, Sicilia, Devon, Düsseldorf (NUTS II level) ……

Place of a special application
i.e. 3ieme district de Paris, Messina, campus of Oxford University ……

Scenarios

5. Please consider the following scenarios for your region: „*In the year 2020 …*

… energy for buildings will be provided 25% by Renewable local resources." SCENARIO 1

Do you think this scenario is …	Yes, definitely			No, definitely
… realistic and describes an attainable future state.	☐	☐	☐	☐
ambitious and courageous.	☐	☐	☐	☐
attractive and desirable.	☐	☐	☐	☐

SCENARIO 2: … energy consumption in buildings will be dropped by 50% per square meter and year."

Do you think this scenario is …				
… realistic and describes an attainable future state.	☐	☐	☐	☐
ambitious and courageous.	☐	☐	☐	☐
attractive and desirable.	☐	☐	☐	☐

6. Please choose <u>one</u> of the scenarios above for your further consideration. I choose
- ☐ Scenario 1
- ☐ Scenario 2

Fax: W.Baaske +43-7582-81981-94

1

STUDIA

STUDIA

CAMELIA Workpackage 6 Bioenergy Expert Questionnaire vs.1.0

Buildings

7. Which of the following building types would you consider to be most appropriate for realizing that scenario?

Please choose maximum 3 building types.

- ☐ one-family houses
- ☐ buildings with up to 20 dwelling units
- ☐ buildings with 20 and more dwelling units
- ☐ supermarkets, shopping centres, storehouses
- ☐ industrial production buildings
- ☐ tourism, recreational resorts, swimming-baths
- ☐ bureaus, private or public administration
- ☐ schools, universities
- ☐ old city centres
- ☐ urban business quaters
- ☐ urban high density residential quaters
- ☐ Other .....

Technologies

8. Which of the following technologies would you consider to be most appropriate for realizing that scenario?

	Yes, definitely			No, definitely
installation of solar thermie	☐	☐	☐	☐
photo voltaic	☐	☐	☐	☐
Wind turbine	☐	☐	☐	☐
Heat pumps	☐	☐	☐	☐
Gas turbine	☐	☐	☐	☐
Gas Motor	☐	☐	☐	☐
Steam turbine	☐	☐	☐	☐
Fuel Cells	☐	☐	☐	☐
Heat storage	☐	☐	☐	☐
Absorption / Adsorption cooling	☐	☐	☐	☐
Compression cooling	☐	☐	☐	☐
Insulation	☐	☐	☐	☐
Solar and climate optimized architecture and construction	☐	☐	☐	☐
Ventilation	☐	☐	☐	☐
Shadowing	☐	☐	☐	☐
Specific distribution technology	☐	☐	☐	☐
Others	☐	☐	☐	☐

9. Local renewable energy sources to be used to feed the system:

	Yes, definitely			No, definitely
Solar	☐	☐	☐	☐
Wind	☐	☐	☐	☐
Waves	☐	☐	☐	☐
Hydropower	☐	☐	☐	☐
Geothermie	☐	☐	☐	☐
Wood / wood chips / pellets	☐	☐	☐	☐
Straw, peat, bark or other organic wastes	☐	☐	☐	☐
Agricultural biogas	☐	☐	☐	☐
Landfill or sewage gas	☐	☐	☐	☐
Reformed gas, pyrolysis gas	☐	☐	☐	☐
Others	☐	☐	☐	☐

10. Please, describe your most favourite application technology in words!

Qualitative description: (a maximum of 500 signs)

.....

.....

.....

.....

Fax: W.Baaske +43-7582-81981-94

2

STUDIA

STUDIA

Winners and loosers

11. Which persons, which person groups and which organizations are affected by this scenario and your most favourite technologies?

	Strong positive			Strong negative
Building owners	☐	☐	☐	☐
Building inhabitants and workers	☐	☐	☐	☐
Neighbors	☐	☐	☐	☐
Tourists	☐	☐	☐	☐
Local business entrepreneurs	☐	☐	☐	☐
Regional industry	☐	☐	☐	☐
European industry	☐	☐	☐	☐
Regional developers, labour, environment NGO acteurs	☐	☐	☐	☐
Regional politicians and municipal officers	☐	☐	☐	☐

12. Which effects can be promoted from the scenario and the related technologies?

	Yes, definitely			No, not at all
Health promotion	☐	☐	☐	☐
Feel comfortably	☐	☐	☐	☐
Air Quality	☐	☐	☐	☐
Water Quality	☐	☐	☐	☐
Preservation of Soil Quality	☐	☐	☐	☐
Preservation of Non-Renewable Resources	☐	☐	☐	☐
Biodiversity	☐	☐	☐	☐
Noise Reduction	☐	☐	☐	☐
Transport and Traffic Reduced	☐	☐	☐	☐
Landscape Amenities	☐	☐	☐	☐
Preservation of Building Substance and Amenities	☐	☐	☐	☐
Education and Qualification	☐	☐	☐	☐
Development of a Culture of Cooperation and Participation	☐	☐	☐	☐
Mitigating Rural Depopulation and Over-Ageing	☐	☐	☐	☐
Diversification	☐	☐	☐	☐
Less Poverty	☐	☐	☐	☐
Integration and Employment of Weak Target Groups	☐	☐	☐	☐
Support of Regional Pioneers	☐	☐	☐	☐
Conformity with Regional Development Vision / Strategies	☐	☐	☐	☐
Security of Supply / Risk Diversification	☐	☐	☐	☐
Regional Growth	☐	☐	☐	☐
Export Potential	☐	☐	☐	☐
Regional Trade Balance / Independent from Imports	☐	☐	☐	☐
Sustainable Use of Renewable Resources	☐	☐	☐	☐
Regional Key Projects and Technologies	☐	☐	☐	☐
Establishment of a Regional Knowledge Base	☐	☐	☐	☐
Increased Productivity	☐	☐	☐	☐
Enhanced Competitiveness of Enterprises	☐	☐	☐	☐
Support of Related Industries and Sectors	☐	☐	☐	☐
Improved Infrastructure	☐	☐	☐	☐
Increased Employment and Job Supply	☐	☐	☐	☐
Income Creation	☐	☐	☐	☐
Induced Investment	☐	☐	☐	☐

Fax: W.Baaske +43-7582-81981-94

STUDIA

STUDIA

13. Which sectors will have added value effects or occupational effects?

	Strong positive			Strong negative
Agriculture, forestry, fishing	☐	☐	☐	☐
Electricity, gas and water suppliers	☐	☐	☐	☐
Technical equipment and service providers	☐	☐	☐	☐
Teachers, researchers, consultants	☐	☐	☐	☐
Real estate and renting	☐	☐	☐	☐
Building sector	☐	☐	☐	☐
Plant engineering and construction	☐	☐	☐	☐
Transportation and storage provider	☐	☐	☐	☐
Financial intermediators, banks, investors	☐	☐	☐	☐
Municipal services: Sewage and refuse disposal	☐	☐	☐	☐

Acceptance

14. Which kind of effects are important to your region?

	Yes, definitely			No, not at all
Health promotion	☐	☐	☐	☐
Feel comfortably	☐	☐	☐	☐
Air Quality	☐	☐	☐	☐
Water Quality	☐	☐	☐	☐
Preservation of Soil Quality	☐	☐	☐	☐
Preservation of Non-Renewable Resources	☐	☐	☐	☐
Biodiversity	☐	☐	☐	☐
Noise Reduction	☐	☐	☐	☐
Transport and Traffic Reduced	☐	☐	☐	☐
Landscape Amenities	☐	☐	☐	☐
Preservation of Building Substance and Amenities	☐	☐	☐	☐
Education and Qualification	☐	☐	☐	☐
Development of a Culture of Cooperation and Participation	☐	☐	☐	☐
Mitigating Rural Depopulation and Over-Ageing	☐	☐	☐	☐
Diversification	☐	☐	☐	☐
Less Poverty	☐	☐	☐	☐
Integration and Employment of Weak Target Groups	☐	☐	☐	☐
Support of Regional Pioneers	☐	☐	☐	☐
Conformity with Regional Development Vision / Strategies	☐	☐	☐	☐
Security of Supply / Risk Diversification	☐	☐	☐	☐
Regional Growth	☐	☐	☐	☐
Export Potential	☐	☐	☐	☐
Regional Trade Balance / Independent from Imports	☐	☐	☐	☐
Sustainable Use of Renewable Resources	☐	☐	☐	☐
Regional Key Projects and Technologies	☐	☐	☐	☐
Establishment of a Regional Knowledge Base	☐	☐	☐	☐
Increased Productivity	☐	☐	☐	☐
Enhanced Competitiveness of Enterprises	☐	☐	☐	☐
Support of Related Industries and Sectors	☐	☐	☐	☐
Improved Infrastructure	☐	☐	☐	☐
Increased Employment and Job Supply	☐	☐	☐	☐
Income Creation	☐	☐	☐	☐
Induced Investment	☐	☐	☐	☐

15. Which other reasons may persons have to accept and approve this measure?

Qualitative description: (a maximum of 500 signs)

.....

Fax: W.Baaske +43-7582-81981-94

STUDIA

STUDIA

……
……
……

16. Which reasons may persons have to refuse your favourite technology and what are the main constraints in comparison with conventional / fossil fuel based solutions?

	Yes, definitely			No, not at all
Low competitiveness	☐	☐	☐	☐
Investment costs	☐	☐	☐	☐
Biofuel prices	☐	☐	☐	☐
Longtime security of biofuel prices	☐	☐	☐	☐
Lacking image support, e.g. by prominent politicians	☐	☐	☐	☐
Missing or unfavourable regional policies	☐	☐	☐	☐
Missing or unfavourable national policies	☐	☐	☐	☐
Missing or unfavourable European policies	☐	☐	☐	☐
Missing availability of cheap investment capital	☐	☐	☐	☐
Security and guarantees demanded	☐	☐	☐	☐
Legislative demands for development and planning	☐	☐	☐	☐
Legislative demands for environmental regulation	☐	☐	☐	☐
Legislative demands for construction	☐	☐	☐	☐
Legislative demands for operation	☐	☐	☐	☐
Legislative demands for treatment of residues	☐	☐	☐	☐
Problems with neighbours	☐	☐	☐	☐
Problems within promoter consortium	☐	☐	☐	☐
Government promotes conventional solutions	☐	☐	☐	☐
End user promote conventional solutions	☐	☐	☐	☐
Conventional providers promote their solutions	☐	☐	☐	☐
Envy	☐	☐	☐	☐
Lacking information concerning individual benefits	☐	☐	☐	☐
Lacking trust in alternative technology providers	☐	☐	☐	☐
Lacking trust in alternative technologies	☐	☐	☐	☐
Lacking environmental concern	☐	☐	☐	☐
Lacking knowledge in operating and handling	☐	☐	☐	☐
Lacking image transfer	☐	☐	☐	☐
New ideas are always suspicious	☐	☐	☐	☐

17. Other hampering factors, expected real or psychological risks, constraints, please describe in detail:

Qualitative description: (a maximum of 500 signs)

……
……
……
……

Supporting measures

18. What non-technical, e.g. political, economic or educational measures can be attractive and effective in your area to support the realization of that scenario?

Qualitative description: (a maximum of 500 signs)

……
……
……
……

19. How can such hampering factors be overcome?

Qualitative description: (a maximum of 500 signs)

Fax: W.Baaske +43-7582-81981-94

5

STUDIA

STUDIA

……
……
……
……

Evaluation

20. By which means, would you like to have the projects and measures be evaluated in order to control scenario realization?

	Very important	Less important	Not at all important	I do not know
Qualitative methods	☐	☐	☐	☐
Quantitative methods	☐	☐	☐	☐
life cycle analysis: environmental effects	☐	☐	☐	☐
input-output analysis: value added, employment	☐	☐	☐	☐
Cost-benefit analysis: intangible effects	☐	☐	☐	☐
Opportunity costs: comparing competitive investments	☐	☐	☐	☐
Contingent valuation: subjective readiness to pay	☐	☐	☐	☐
Hedonic prices: comparing welfare effects	☐	☐	☐	☐
Other: ……	☐	☐	☐	☐

21. Should the project be evaluated by such means …

	Very important	Less important	Not at all important	I do not know
Ex ante, before starting	☐	☐	☐	☐
Within construction and erection, accompanying	☐	☐	☐	☐
After one year of operation	☐	☐	☐	☐
After five years of operation	☐	☐	☐	☐

YOUR FEEDBACK

What do you think about this questionnaire? What would you suggest to improve it?

……
……
……
……

If you were interested to apply this questionnaire (in an adapted version) in your region or for a specific target group, please give us your contact details. We will then get in contact with you.

Your name, address, phone, fax, e-mail

……
……
……
……

THANK YOU FOR YOUR CONTRIBUTION!

Fax: W.Baaske +43-7582-81981-94

STUDIA

STUDIA

Methods' questionnaire

Evaluate Projects for "Building supply with local renewables"

concerning environmental impact and socio-economic effects

Please, answer due to your personal opinion! Use separate sheets for each method.

Which method do you consider?

.....

Please give a short description:

.....

.....

Effects

1. Which kind of environmental impacts is the method capable to evaluate? *Please tick all impacts that apply*

- ☐ Sustainable Use of Renewable Resources
- ☐ Air Quality
- ☐ Preservation of Non-Renewable Resources
- ☐ Biodiversity
- ☐ Water Quality
- ☐ Preservation of Soil Quality
- ☐ Landscape Amenities
- ☐ Transport and Traffic Reduced
- ☐ Climatic Change
- ☐ Noise Reduction / Protection

2. Which kind of socio-economic effects is the method capable to evaluate? *Please tick as many as apply*

- ☐ Support of Related Industries and Sectors
- ☐ Enhanced Competitiveness of Enterprises
- ☐ Export Potential
- ☐ Induced Investment
- ☐ Regional Key Projects and Technologies
- ☐ Conform with Regional Development Vision
- ☐ Diversification
- ☐ Preserve Building Substance and ambiente
- ☐ Increased Employment and Job Supply
- ☐ Health promotion
- ☐ Income Creation
- ☐ Mitigating Rural Depopulation / Over-Ageing
- ☐ Pay-back time, return on investments
- ☐ Regional Trade Balance / Indep. from Import
- ☐ Regional Growth
- ☐ Increased Productivity
- ☐ Establish a Regional Knowledge Base
- ☐ Security of Supply / Risk Diversification
- ☐ Improved Infrastructure
- ☐ Support of Regional Pioneers
- ☐ Culture of Cooperation and Participation
- ☐ Feel comfortably, Quality of Life
- ☐ Education and Qualification
- ☐ Integrate / Employ Weak Target Groups
- ☐ Less Poverty
- ☐ Land usage and housing availability

3. Other? .....

Application

4. When should the method be applied?

☐ Ex ante ☐ Ex post ☐ both possible

5. To which building types could the method be applied within appropriate time and effort? *Please choose all appropriate categories*

☐ single family houses ☐ hotels, hospitals ☐ small villages ☐ regions of 100.000 inhabitants or more

6. What are the specific advantages the method provides, or disadvantages to cope with?

advantages or benefits:	*disadvantages:*
.....	.....
.....	.....

7. Please indicate references to supporting software or application projects

www..... .....

www..... .....

www..... .....

PLEASE SEND TO: Wolfgang Baaske, ST UDIA, Panoramaweg 1, 4553 Schlierbach, Austria, Fax +43 7582 81981 94

P.S.: THANK YOU FOR YOUR CONTRIBUTION!

***

STUDIA