NEED AND OPTIONS FOR A REGENERATIVE ENERGY SUPPLY IN HOLIDAY FACILITIES

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ABSTRACT: Today, there is a general consensus on the existence of an anthropogenic increase of greenhouse gases in the atmosphere and the necessity of measures to tackle the resulting climate change. The tourist industry as a fast growing sector should to do its bit, too, especially since it is already affected by climate change itself. The following article presents an option for mitigating climate change by reduction of greenhouse gas emissions from activities in holiday resorts. It shows how holiday facilities can be supplied with the different commodities like electricity, water etc. without release of greenhouse gases. The energy originates from wind and the sun and is stored in form of hydrogen when necessary. The benefits of such supply schemes are manifold. Apart from the CO_2 emission free energy provision other positive external effects can be realised, the marketing position can be strengthened and finally the basis of tourism industry itself can be sustained.

1. INTRODUCTION

As a consequence to the increasing awareness of a potential climate change induced by man, the Intergovernmental Panel on Climate Change (IPCC) was established in 1988 in order to provide authoritative assessment to governments of states of knowledge concerning climate change (Grubb 1999 pp. 3-4). The so-called third assessment report states that "there is new and stronger evidence that most of the warming over the last 50 years is attributable to human activity" (IPCC 2001, p.10). A temperature rise between 1.4 and 5.8 °C until the end of this century is forecast and the frequency of extreme weather events like storms, floods and droughts is likely to increase. Furthermore, the sea-level may rise of up to 88 cm. It is important to note that "emissions of CO_2 due to fossil fuel burning are virtually certain to be the dominant influence on the trends in atmospheric CO_2 concentration during the 21st century" (IPCC 2001, p.12). The developing countries do not carry much of the responsibility. However, they will be hit first and hardest in the future and they do not have the means required for adaptation. Latest scientific analyses, taking into account the carbon cycle which is affected by climate change (more CO_2 will be released from the soil with rising temperatures for example), even forecast a more alarming temperature rise of about 8°C by 2100 (Met Office 2000).

Against this background, the international community has agreed to take action by agreeing on the UN-Framework Convention on Climate Change (UNFCCC) in 1992: Fuel switch to less carbon intensive fuels in power plants, measures to increase energy efficiency, increased use of renewable energies and other measures are supported by many governments, since the main part of human induced carbon dioxide emissions is produced by combustion of fossil fuels for generation of electricity and in the transportation sector. However, so far the efforts have not been sufficient and emissions continue to increase in the OECD countries.

Even though governments try to address environmental problems by appropriate policies and measures the tourist industry can acknowledge its responsibility for the environment by additional action (Federal Ministry of Economics 1993, pp. 9-10). Checking the potential for greenhouse gas emission reductions by polluters reveals that this is often possible at little or even no costs and may result in other benefits. In the following sections an option for a reduction of CO_2 emissions from energy consumption in holiday resorts is presented.

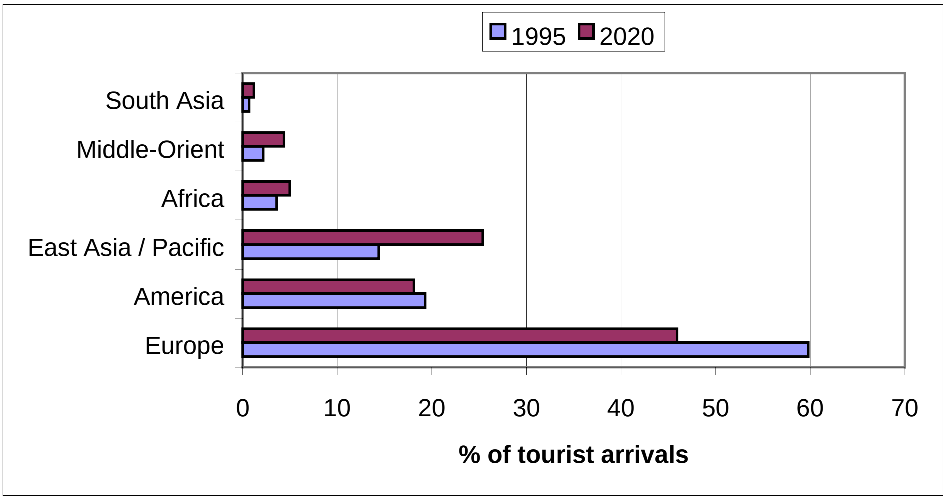
For a reliable assessment of an renewable energy based system's capability to supply an artificial holiday resort, a simulation model has been developed. With this computer based tool different scenarios have been studied which resulted in solutions worthwhile to discuss economic and / or environmental aspects to be considered by future management decisions of tourist companies.

The use of some of the flexible mechanisms under the Kyoto-Protocol that are likely to be applicable in the very near future after the successful climate negotiations in Bonn in July 2001 can also help to both, implementation of new energy supply structures in holiday facilities and additional revenues for tourist companies by sale of emission reductions.

2. THE TOURISM INDUSTRY AND CLIMATE CHANGE

Recalling the impact of rising temperatures and notably the areas struck first, the tourist industry is likely to be hit by climate change sooner than other sectors in industrialised countries (see Fig. 1). The sea-level rise will threaten islands like the Maldives and lead to coastal erosion on beaches. Costs for adaptation and rising insurance fees due to higher losses owing to extreme weather events will make holidays more expensive and might consequently cause decrease of demand or bankruptcies. Other effects supposed to be positive like higher mean temperatures are unlikely to offset the adverse impacts. There might be some "winners" in the middle latitudes (for example in the Baltic region or around the North Sea) but in typical "summer countries" it may become intolerably hot. The bioclimatic chart by Boniface and Cooper (1987 p.20) suggests that already a change of a few degrees in temperature or an increase of a few percent in humidity can change an optimum state in terms of optimal circumstances for tourist activity to sub-optimal conditions (Bull & Craig-Smith 1990, p.6). Increased variability of weather can also be judged negative. Furthermore, the ski industry already faces severe problems due to decreasing snow fall even in traditional regions like the Alps. Customers' health can be affected directly by more and stronger heat waves or by more frequent diseases transmitted by mosquitoes such as malaria and dengue fever (Epstein 2000).

Fig. 1: Market shares with respect to regions (World Tourism Organisation［WTO］2000)



This is why action is recommended. In this context it should be mentioned that other branches affected by climate change already reacted: Insurance companies having already lost major players after natural disasters (like hurricane Andrew in 1992), recently agreed to adjust portfolios favouring investments that help mitigate climate change (Houlder 2000). Other companies have imposed voluntary limits on their emissions as an act of corporate environmental responsibility. Members of the "Partnership for Climate Action" publicly declared a global greenhouse gas emission limitation commitment backed by management actions, policies and incentives to achieve them.

What can the tourism industry do? Long-term response options are depicted in Fig. 2. Apart from adapting to climate change, mitigation options should also be taken into account in order to change the alarming development. This is all the more true against the background of recent and expected growth (see Fig. 3).

Fig. 2: Long-term respond options to climate change for tourist companies (following Bull & Craig Smith 1990 p.14 and Krupp 1995 p. 17)

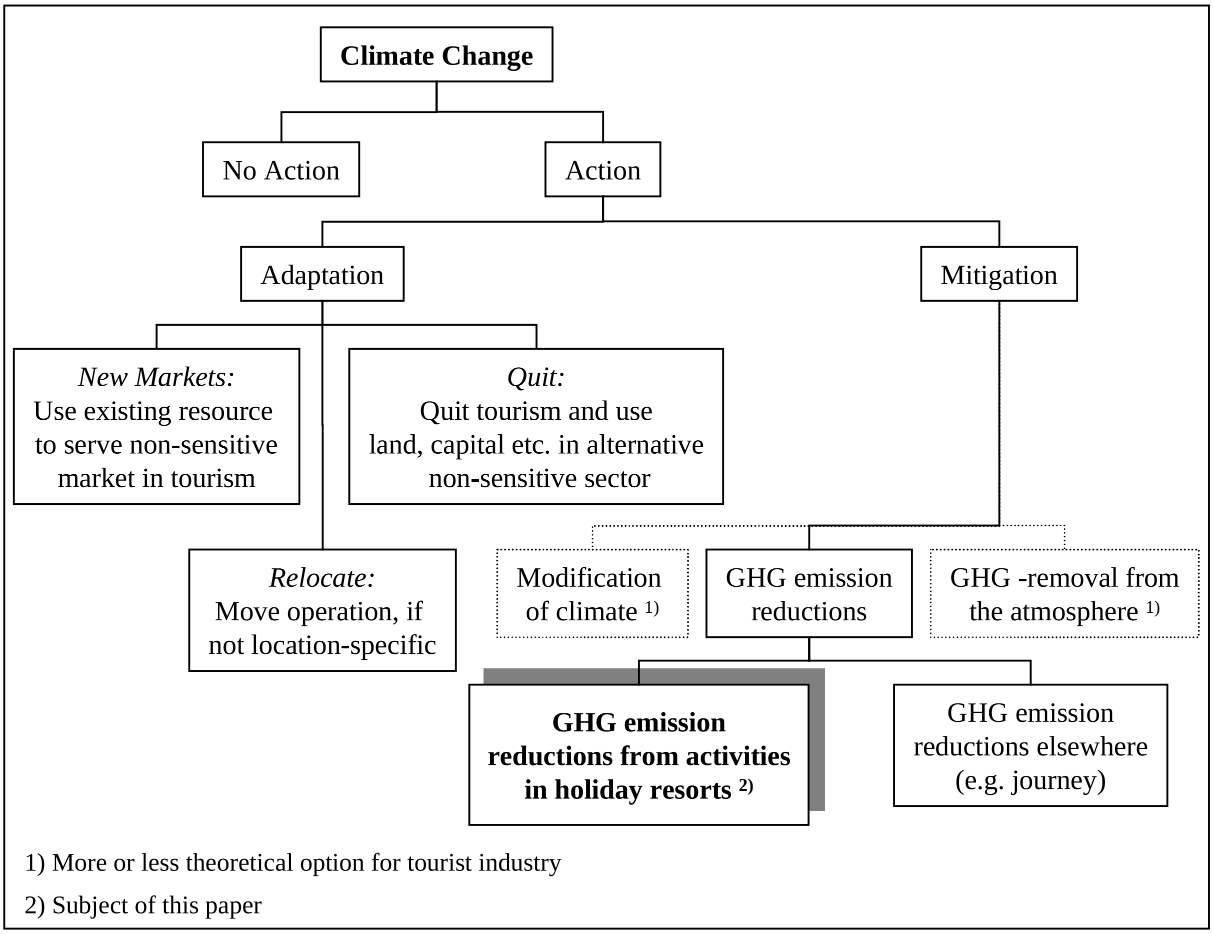
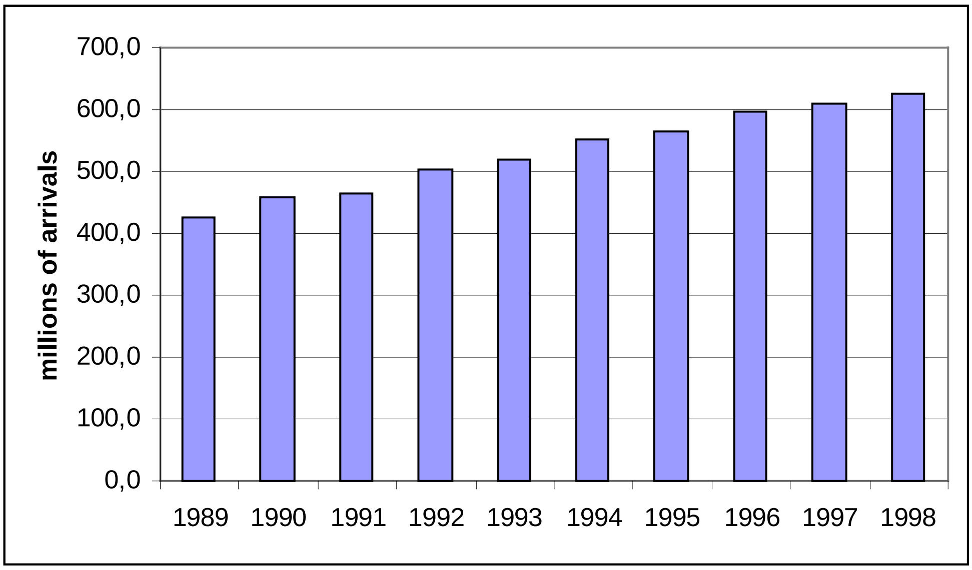


Fig. 3: International tourist arrivals 1989-1998 (WTO 1999)



The current number of international arrivals of more than 600 million is expected to triple within the next 20 year and in addition to these 600 Mio international arrivals approximately 2000 Mio domestic trips have to be born in mind (Hamele 1998).

Considering the potential for GHG emission reductions within the tourist industry, two kinds of sources have to be distinguished:

(a) Emissions due to the journey i.e. emissions from transportation to the location. Even if these emissions can amount to 90 % of the total emission caused by a holiday trip (depending on the destination), the tourist companies' influence to lower them is more or less limited: A possibility would be to make people stop buying long distance journeys - which is obviously not in the interest of the tourism industry. An alternative would be a support of development of less polluting vehicles like (green) hydrogen fuelled aircraft or the promotion of a shift of means of transportation (use of trains instead of cars or aeroplanes). This in turn also might be difficult because of interconnections of transportation and tourism companies and the resulting contradictory aims. Influence on emission reduction by improved scheduling of airport operation or similar measures is also limited. One solution might be the purchase of emission reduction credits by tourist companies in order to offset emissions due to journeys by their customers. A solution for this dilemma has to be found, however, this issue is not part of the further discussion in this paper.

(b) Emissions at the destination area due to energy supply to meet the customers' demand for electricity, water and other commodities. The possibility to lower these emissions can be judged very high, since operators of holiday facilities are free to choose their energy suppliers and to invest locally in new supply structures.

Despite the large number of literature concerning tourism and environment there is little said on the latter aspect. For example, the "Berlin declaration" (Biodiversity and Tourism 1997) and other sources often cite as goals the protection of landscape in coastal areas like dunes or preservation of biodiversity. Environment protection within the tourism sector is thus often focused only on local aspects. Key figures like volume of waste or water and energy consumption per guest and night indicate how hotels influence local life. Global impacts resulting from tourism are recognised as a problem but in contrast to local problems, only few suggestions are made how to resolve the former: The aforementioned key figures are of course linked to GHG emissions and thus to climate change, but to our best knowledge there is nothing said on the origin of energy required for the supply of different commodities. This is why we focus on this specific issue in the following sections while refraining from investigating other publications that deal mainly with local aspects or environment protection in a general, theoretical way.

3. POSSIBLE NONPOLLUTING ENERGY SUPPLY STRUCTURES

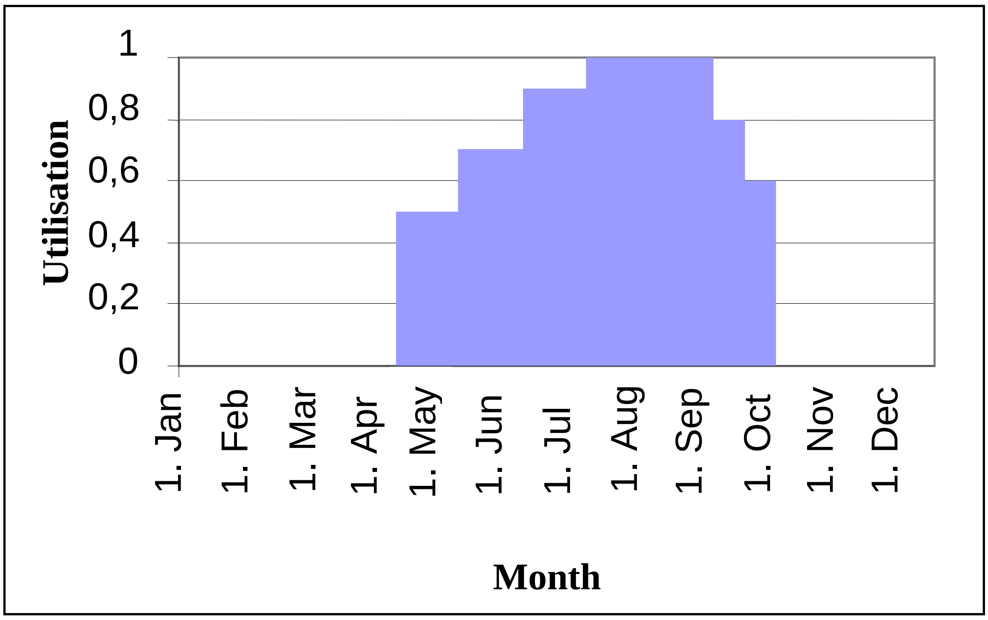
In this chapter it is shown how a hypothetical facility that is close to reality and that is not connected to any electricity grid can be supplied CO_2-emission free with the commodities power, heat, cold (air), water and means of transportation. On the supply side wind turbines and solar modules are put in. The design of the facility is that of a “club resort” (e.g. ClubMed, Club Robinson) and is based on data from existing ones (see Table 5 in annex). The placement was chosen to be located on the island of Kos in the Mediterranean sea (Greece). It has 600 beds. The location was chosen due to favourable conditions for this kind of renewable energies in this region.

The club resort is equipped with a swimming-pool, tennis courts, a golf training course and a sauna. A local car rental agency is also available, so that the customers do not have to miss anything compared to conventional facilities. Table 1 summarises the most important characteristics. The opening time lasts from 15th April to 15th October with the maximum utilisation occurring in July and August due to high summer season (see Fig. 4).

Table 1: Size and configuration of simulated holiday facility

Number of rooms	300
Number of beds	600
Size	100,000 sq m
- Sealed area	85,000 sq m
- Green area (irrigation required)	15,000 sq m
Swimming-Pool (outside)	Available (30 m x 50 m)
Swimming-Pool (inside)	Not available
Car rental	Available
Tennis (Number of courts)	12
With floodlight	3
Golf	Training course
Horse riding	Not available
Sauna	Available

Fig. 4: Utilisation for simulated holiday facility



This utilisation curve is typical of holiday facilities in this region. The reasons for this utilisation curve are inter alia the holiday periods in major (Northern) European countries and the favourable climatic conditions: little precipitation and high temperatures (see Tab. 2). On the other hand these climatic conditions intensify the energy demand with regard to the extrema due to the enormous cooling load and the huge volume of water required for irrigation in summer. The average annual utilisation is about 40 %.

Table 2: Climatic conditions on the island of Kos

Average number of rainy days

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
30	26	21	13	9	3	0	0	4	16	27	29

Average high temperature [°C]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
13	12	15	18	22	27	30	29	27	22	17	13

3.1 BASIC APPROACH

Not all energy expenditures are fully variable. For example, common rooms like reception halls, television rooms or saunas require electricity regardless of the current utilisation. For certain activities like cleaning of common rooms, water demand is also independent of exact utilisation. This is why the consumption was separated in a fixed and a variable part as can exemplary be seen in Figures 5 and 6. The variable part is a function of the number of guests.

Fig. 5: 15-min. electricity demand on a day with 100% utilisation.

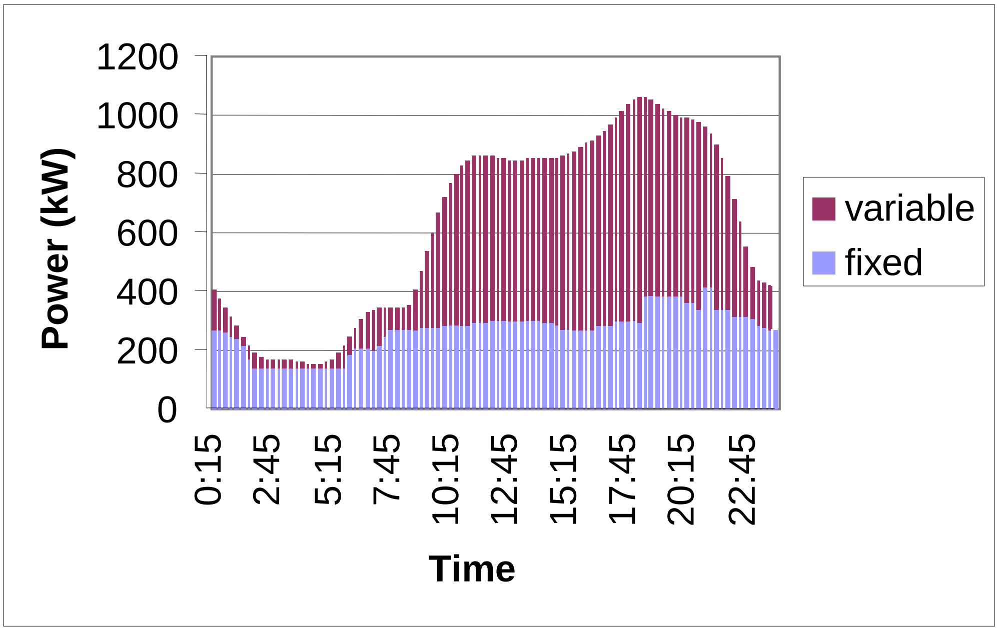
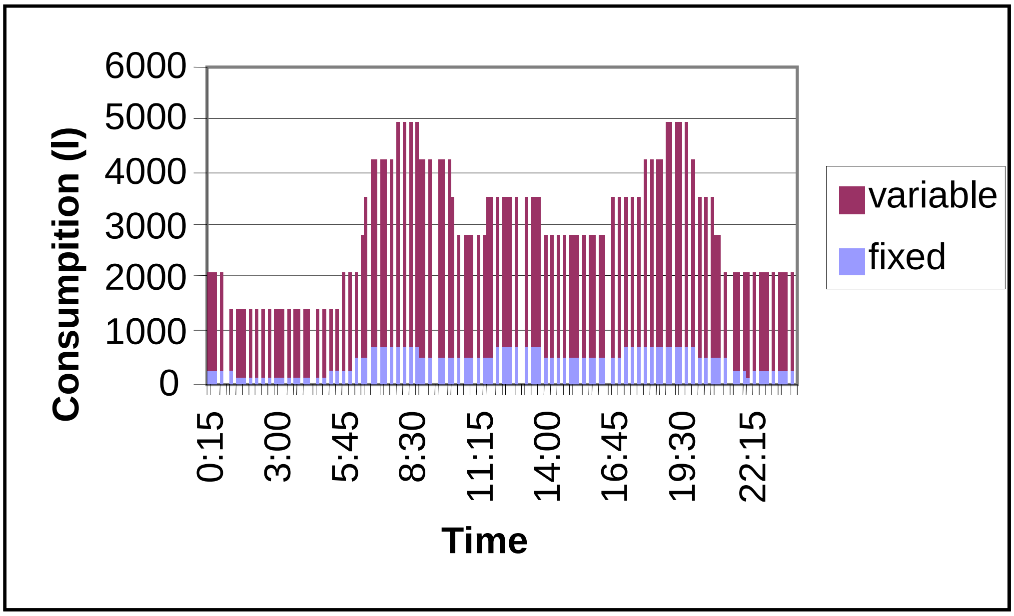


Fig. 6: 15-min water demand on a day with 100% utilisation (without irrigation of green areas).



The data for the daily consumption curves for the commodities were taken from literature (Dröscher (1997), Deutscher Verein des Gas- und Wasserfaches e.V. (without date), Recknagel, Schrameck

(1997)). From the great variety of components that can be used a choice was made following general technical and economic reason. To meet the demand for water, a seawater desalination plant (reverse osmosis) was put in. Heat and cold were delivered with heat pumps and refrigerating machines respectively. To provide means of transportation hydrogen fuelled cars were provided[1]. Considering the assumed utilisation, one can calculate yearly consumption curves for each of the commodities. The yearly water consumption curve is for instance calculated as follows:

$$D^{Wt}_i = D^{Wf}_i + D^{Wv} * z_i \qquad (1)$$

Where

D^{Wt}_i	= Total demand for water in time interval i	(m^3)
D^{Wf}_i	= Fixed demand for water in time interval i	(m^3)
D^{Wv}	= Variable demand for water per guest	(m^3/person)
z_i	= Number of guests in time interval i	(persons)

By combining the discrete demand curves with the technical characteristics of a component (e.g. efficiency factor) an energy demand curve can be obtained. For water one gets for example:

$$W^W_i = D^{Wt}_i * e^W \qquad (2)$$

Where

W^W_i	= Energy demand for water production in time interval i	(kWh)
D^{Wt}_i	= Total demand for water in time interval i	(m^3)
e^W	= Index for water production by reverse osmosis	(kWh/m^3)

Finally, by adding up the discrete energy demands W^y for each of the commodities y (i.e. water, heat, etc.) one gets the total energy demand W^T_i in interval i:

$$W^T_i = \sum_y W^y_i \qquad (3)$$

The length of the time-intervals i was 15 minutes and determined by available demand curves. Since tourists expect a certain level of comfort during their holidays the energy demand is a more or less fixed factor. Consequently, the supply side has to be adjusted appropriately when a sufficient energy

[1] Hydrogen fuelled vehicles with combustion engines: According to a concept of the „Hamburger Wasserstoff Agentur

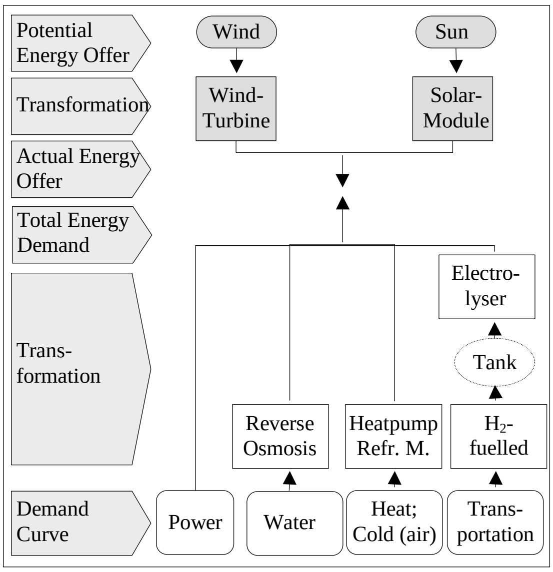
supply is desired. This is why on the supply side various combinations of wind turbines and solar modules were analysed. They provide the total energy E^T_i in interval i. The data for wind speed and irradiation was taken from nearby weather stations. The mean values were calculated over several years.

The resulting energy offer was thereupon balanced with the total energy demand showing the energy surplus S_i that may either be positive or negative (the latter meaning energy shortage):

$$S_i = E^T_i - W^T_i \quad (4)$$

The approach is illustrated in Fig. 7.

Fig. 7: Basic scheme for an autarkic CO_2-emission free energy supply for (holiday) facilities



In contrast to common evaluations of economic efficiency (which for example calculate the annual yield of wind farms based on frequency distributions for wind speed), the energy balance was calculated for each 15 minute-intervals in a year. This procedure is necessary since the energy supply of the club resort has to be guaranteed not only in the annual balance but at any time. The simple use of frequency distributions is not satisfactory since the energy offer could possibly be sufficient at every time. On the other hand it is conceivable that there is strong wind in winter when utilisation is lowest and calm wind in summer when utilisation is highest. This would require a huge (seasonal)

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storage capacity. Figure 8 shows an example of a 15-min power balance for the basis scheme. Table 3 summarises the results for different installations on the supply side.

Fig. 8: Exemplary 15-min power balance

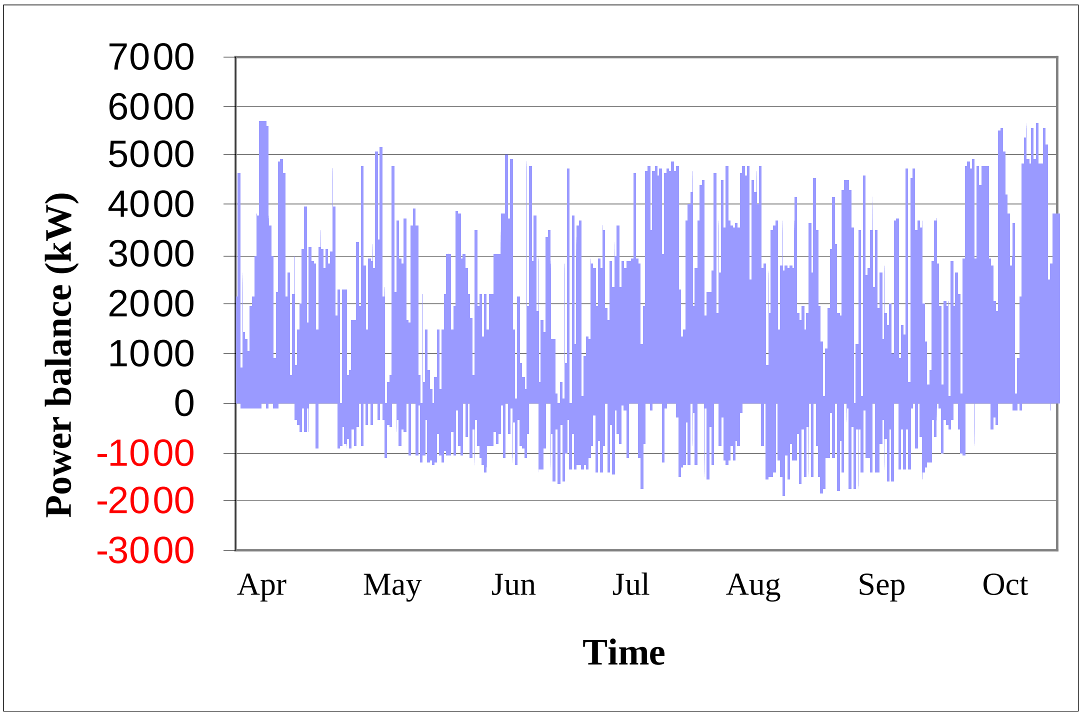


Table 3: Energy balances for basic approach

No.	Inst. WT-Power (MW)	Inst. PV-Power (MW)	Annual Energy Surplus (GWh)	Deficit *)
1	1,5	0	0,9	48.61%
2	5,0	0,0	14,8	23.0%
3	10,0	0,0	34,1	17.1%
4	15,0	0,0	53,5	13.6%
5	20,0	0,0	72,8	10.4%
6	30,0	0,0	111,6	10.2%
7	0,0	0,6	-3,7	86.4%
8	0,0	1,2	-2,7	81.7%
9	0,0	3,0	0,1	61.8%
10	5,0	0,6	15,7	21.6%
11	10,0	0,6	35,1	15.3%
12	5,0	1,2	16,6	19.5%
13	10,0	1,2	36,0	14.8%

Inst.= Installed
WT = Wind Turbine; PV = Photovoltaics
*) Deficit: indicates the percentage of intervals when energy is short

It turns out that the facility can be supplied with renewable energies without difficulty if only the annual balance is viewed. However, if the smaller time intervals are treated it can be seen that a permanent sufficient energy supply cannot be guaranteed, even with large installed power capacities.

3.2 EXPANDED SYSTEM

Due to the periods of energy shortage the system is expanded of (energy) storage, so that any energy surplus can be stored to a certain degree. Additionally, the discrete energy demand curves can be adapted selectively. To influence the energy demand, water tanks and ice storage are used. To give an example, it is thus possible to produce water during the night when total energy demand is lowest and to feed it into the mains the next day at peak load times. Referring to equation (2) one can then write:

$$W^{W}_{i} = (D^{Wt}_{i} + D^{Wt}_{i+x}) * e^{W} \qquad (5)$$

Where x is equal or greater than zero and can be set more or less as desired. Using storage consequently allows:

$$W^{W}_{i+x} \leq D^{Wt}_{i+x} * e^{W} \qquad (6)$$

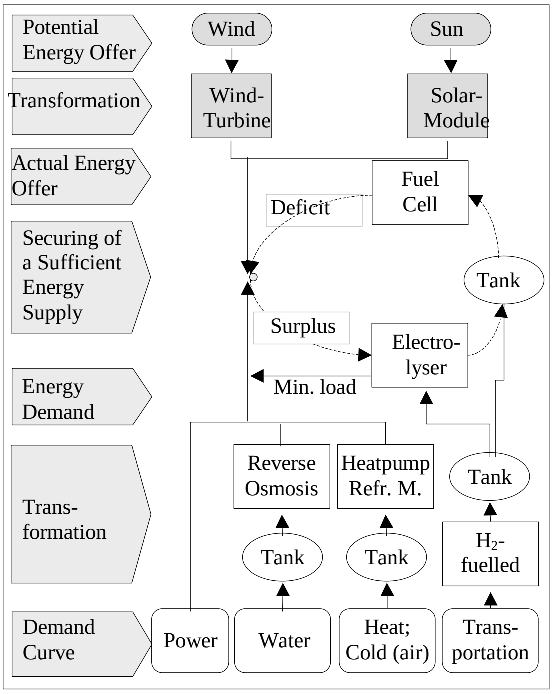
and generally

$$S_{i} \geq 0 \quad \text{for all } i \qquad (7)$$

A total energy demand curve as even as possible is desirable, since the maximum power of wind turbines and solar modules to be installed as well as the size of the back-up device is strongly related to that figure.

To store energy surplus, a combination of electrolysers, fuel cells and pressure tanks is used (see Fig. 9). Electrolysers split water into hydrogen and oxygen while consuming energy. The hydrogen is stored in the pressure tanks whereas the oxygen is released into the atmosphere. In contrast, fuel cells provide energy by simple oxidation of hydrogen where water is the only product. The resulting system enables an operation of the holiday facility without a diesel generator as back-up device and thus without releasing of greenhouse gases. Furthermore, the selected storage seems to be superior to conventional batteries due to limited capacity and cycle stability of the latter. Finally, electrolysers are already set in for the production of hydrogen as fuel for transportation. In that way both applications of hydrogen - energy storage and fuel for transportation – are sensibly combined.

Fig. 9: Expanded scheme for an autarkic CO_2-emission free energy supply for (holiday) facilities



By expanding the system, a sufficient energy supply with the proposed commodities becomes possible at every time. Depending on the total installed power (wind turbines and solar modules) and the adaptation of the energy demand curve, appropriate sized energy storage is necessary. A selection from the large number of design options is presented in table 4.

Table 4: Interaction of installed power and required hydrogen storage capacity

No*)	Inst. WT-Power (MW)	Inst. PV-Power (MW)	Required H_2 Storage Capacity (Nm3)
10	5.0	0.6	~ 140,000
11	10.0	0.6	~ 40,000
12	5.0	1.2	~ 95,000
13	10.0	1.2	~ 33,000

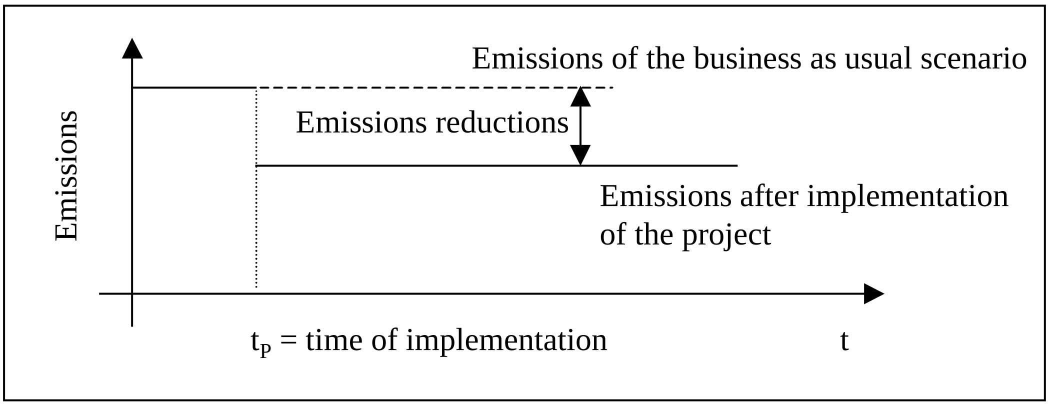
*) see Table 3

In addition to the optimisation problem caused by the interaction of installed power and required storage capacity, one has to keep in mind that the various kinds of storage can partly be substituted against each other. Thus, the integration of the different components into one system leads to a high degree of complexity. On the other hand, complex systems with a multitude of degrees of freedom allow a large variety of designs. However, it would be outside the scope of this paper to explain all the technical details and the resulting complexity. It is important to note that as a result the presented scheme can be adapted to diverse kinds of facilities and local circumstances.

4. USE OF FLEXIBLE MECHANISMS UNDER THE KYOTO-PROTOCOL

Among the four so-called “flexible mechanisms” under the Kyoto-Protocol there are two project based mechanisms that enable the generation of emission reduction certificates that can be sold and thus lead to additional revenues. If two countries with an absolute emission target during the first commitment period (so-called Annex-I countries) are involved, the mechanism is called Joint Implementation resulting in Emission Reduction Units (EURs). In case an Annex-I and a non Annex I-country are undertaking a project, Certified Emission Reductions (CERs) are generated under the Clean Development Mechanism. Generally, they both require the determination of a business as usual scenario (baseline) in order to be able to quantify ERUs and CERs respectively, but they will differ when it comes to detail since environmental integrity is affected in different ways. Again, it would be out of the scope of this paper to discuss the different ways of setting a baseline, however, the basic idea is illustrated in Fig. 10.

Fig. 10: Basis scheme for quantifying emission reductions



Energy related projects are likely to play an important role among the potential projects due to the importance of GHG emissions from fossil fuel burning for energy provision. Depending on the conditions of a concrete project, the presented energy supply scheme could easily qualify as CDM or JI project. This is why decision makers in tourist companies should be aware of these mechanism and check the potential for their application.

5. COSTS AND IMPLEMENTATION

Wind energy is already competitive today and electricity from solar power is available at reasonable costs. However, specific energy costs strongly depend on the question if surplus energy can be sold to external parties, especially in winter when the club is closed. Water and ice storage are already installed in existing facilities with a positive financial effect. But fuel cells and electrolysers are far from being competitive. By now, there are only a few devices constructed that are operated in pilot projects, resulting in costs of about 3 million Euro per unit for both techniques. This is why additional costs would amount to more than 50 Euro per night and guest (for the expanded system) if the concept was implemented today, and would thus be prohibitively high. But due to numerous research and development projects, costs are expected to drop drastically. For example, fuel cells as applied in the simulation are endorsed by the automotive industry due to the favourable characteristics. Conceivable costs may range from 500 to 750 Euro per kW rated power in the future. If these cost reduction potentials are taken into account and if a sale of surplus energy is assumed additional costs can even become negative in five to ten years. Finally, selling ERUs or CERs will lead to additional revenues, that will ,however, strongly depend on the price of CO_2.

Since new technologies as for example fuel cells and electrolysers often face a lack of confidence by potential investors or users, it might be advisable to introduce new energy supply structures in successive steps. In a first step, the use of renewable energies could be increased, accompanied by the installation of ice storage. In a following step fuel cells and electrolysers, that in the meanwhile will have be further improved and spread more widely, could be set in completing the new energy supply structure.

6. OTHER ASPECTS

Apart from the avoided greenhouse gas emissions that entail a global benefit, there are other external affects that are not to be neglected by management decisions in tourist companies. The use of a sea water desalination plant saves the local water resources that are often limited. The construction and use of renewable energy devices can create local employment and replace conventional power plants which in turn results, especially in developing countries, in increased local air quality since pollutants from fossil fuelled power plants like NOx or SO_2 are avoided.

When planning new holiday facilities, the presented supply structure allows the choice of sites where there is no possibility for grid connection (at reasonable costs) at present. The facility could be operated as stand-alone system.

Furthermore, the use of new energy supply structures may be useful under marketing aspects if all aforementioned benefits are communicated adequately. One has to keep in mind that a lot of decisions concerning holidays are influenced by the question if and to what extend resorts are polluting. Guided tours to wind turbines or presentations of fuel cells could be a supplement activity since public interest in renewable energy devices is high.

6. CONCLUSION

Climate is changing due to human activity, especially due to combustion of fossil fuels for energy provision and in the transportation sector. The consequential increase of extreme weather events, the sea-level rise and other effects will affect the tourist industry and most of the effects will be negative. However, the tourism sector is not only a victim but responsible of climate change, too. Apart from adaptation there are some options for mitigation: The reduction potential for emissions that accrue during trips is theoretically high but since the reduction of long distance journeys is not in the tourism companies' interest this potential is restricted. The remaining option is to reduce greenhouse gas emissions at holiday facilities by consequent use of regenerative energy supply structures for both, provision of power and means of transportation.

The presented study shows that, tolerating appropriate technical efforts, holiday facilities can be supplied CO_2-emission free with the commodities electricity, water, heat, cold (air) and mobility. Considering the potential cost reductions in the long run, the simulation reveals, that – certain boundary conditions assumed – a cost neutral supply is possible. In addition to that, positive external effects occur that are not easy to asses monetarily. Since it generally takes some time to enforce a change of mind widely, the tourist management should start to set the course now.

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Annex

Tab. 5: Characteristics of numerous existing club resort in the Mediterranean Sea

No.	Club	Country	Company	Rooms	Max. no. guests	Resort size ('000 sq. m)	Pool (out door)	Pool (in door)	Car rental	Tennis	Golf	Riding (no. of horses)	Sauna	Fitness centre	Opening time
1	Tunesien	Tun	A	253	514	100	yes	no	yes	10 (8)	Compact training course	15	yes	yes	12.3 to January
2	Djerba	Tun	A	300	650	87	yes	no	yes	10 (4)	Compact training course	18	?	?	All the Year
3	Side	Tur	A	300	610	115	yes	no	yes	12 (8)	Compact training course	18	yes	yes	9.4 to 5.11
4	Belek	Tur	A	314	588	120	yes	yes	yes	10 (4)	Compact training course	no	yes	yes	7.4 to 5.11
5	Kreta	Gr	A	135	280	50	yes	no	yes	4 (4)	Compact training course	no	no	yes	21.4 to 30.10
6	Cragèse	F	C	439	?	?	yes	no	outside	10	no	no	?	no	17.4 to 2.10
7	Le Lavandou	F	C	116	?	?	yes	no	?	3	outside	no	?	no	7.5 to 3.10
8	Corfu Ipsos	Gr	C	710 (huts)		?	no	no	yes	15	no	no	?	no	30.5 to 26. 9
9	Gregolimano	Gr	C	413	?	?	yes	no	yes	12 (2)	no	no	?	no	9.5 to 26.10
10	Kos	Gr	C	322	?	?	yes	no	yes	14 (3)	no	no	?	yes	1.5 to 24.10
11	Kalamata	Gr	C	299	?	?	yes	no	yes	4 (2)	no	no	?	no	11.4 to 3.10
12	Donoratico	I	C	565 (huts)		?	yes	no	outside	9 (3)	no	no	?	no	15. 5 to 11.9
13	Kamarina	I	C	686	?	?	yes	no	yes	28 (11)	no	no	?	yes	27.3 to 25. 10
14	Metaponto	I	C	442	?	?	yes	no	?	18 (6)	Practice range	no	?	no	10.5 to 27. 9
15	Ortranto	I	C	425	?	?	yes	no	outside	10 (2)	Practice range	no	?	no	17.5 to 27. 9
16	Santa Teresa	I	C	383	?	?	yes	no	yes	18 (4)	no	no	?	no	20.3 to 23.9
17	Caprera	I	C	514 (huts)		?	no	no	outside	8	no	no	?	no	17.6 to 9.9
18	Cefalu	I	C	496 (huts)		?	yes	no	yes	12 (3)	no	no	?	no	21.6 to 20.9
19	Don Miguel	Sp	C	469	?	?	yes	no	yes	16 (4)	Practice range	no	?	yes	to 30.10
20	Ibiza	Sp	C	410	?	?	yes	no	yes	8 (2)	no	no	?	yes	27.3 to 7.11

Tab. 5: Characteristics of numerous existing club resort in the Mediterranean Sea (continued)

No.	Club	Country	Company	Rooms	Max. no. guests	Resort size ('000 sq. m)	Pool (out door)	Pool (in door)	Car rental	Tennis	Golf	Riding (no. of horses)	Sauna	Fitness centre	Opening time
21	Porto Petro	Sp	C	480	?	?	yes	no	yes	16	no	no	?	no	2. 5 to 26.9
22	Athenee Palace	Tun	R	286	?	110	yes	yes	?	10 (6)	no	12	yes	yes	All the Year
23	Maris	Tur	R	287	?	156	yes	yes	?	8 (2)	no	no	yes	yes	10.4 to 6.11
24	Camyuvy	Tur	R		?	88	yes	no	?	12 (4)	no	no	no	no	16.4 to 3.11
25	Pamfilya	Tur	R	282	?	151	yes	no	?	12 (3)	no	no	yes	no	16.4 to 3.11
26	Daidalos (Kos)	Gr	R	268	?	220	yes	no	?	12 (4)	Training course	no	yes	yes	27.4 to 26.10
27	Kyllini Beach	Gr	R	312	?	150	yes	yes	?	16 (2)	Training course	no	yes	yes	15.4 to 28.10
28	Cala Serena	Sp	R	202	?	100	yes	no	?	11 (5)	Training course	no	yes	no	1.4 to 5.11
29	Apulia	I	R	394	?	210	yes	no	?	13 (4)	no	no	yes	no	23.5 to 10.10
30	Djerba	Tun	R	301	?	120	yes	no	?	16 (4)	no	12	yes	no	3.4 to 6.11

Legend:

Tun	=	Tunisia	A	=	Club Aldiana
Tur	=	Turkey	C	=	Club Méditerranée
Gr	=	Greece	R	=	Club Robinson
I	=	Italy			
Sp	=	Spain	Outside	=	Outside of the resort area
F	=	France			

For tennis: figuere in brackets = courts with floodlight

Source: Catalogues of corresponding companies (2000)