

# Investigating Stakeholder Decision Priorities for Adapting to Climate Change in the Lake Balaton Recreational Area of Hungary:

Summary of Workshops  
Held in SIÓFOK, BALATONALMÁDI  
and KESZTHELY, HUNGARY,  
During October 2007 - February 2008

Livia Bizikova  
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## Foreword

This report provides a summary of the outcomes of a series of capacity-building workshops conducted in Hungary's Lake Balaton region as part of the Balaton Adaptation Project<sup>1</sup>. The main purpose of the workshops was twofold: 1) to discuss local stakeholders' past and present decisions about adapting to climate change in the broader context of other forces of global and local change, and 2) to outline adaptation alternatives that could be implemented in the future. The four workshops were conducted between 26 October 2007 and 27 February 2008 in three towns around Lake Balaton: Siófok, Keszthely and Balatonalmádi.

Tourism is the main source of income for small businesses and municipalities in the towns around Lake Balaton. Recent changes in weather patterns during the main tourist season (and beyond) increased the interest of regional actors, including the Lake Balaton Development Coordination Agency (LBDCA), in investigating local vulnerabilities, adaptation options and the capacities needed to successfully tackle the local impacts of climate change.

Building on what we heard in the four workshops, we present recommendations for initiatives that promote sustainable development projects that are based on traditional local knowledge, support conservation initiatives, diversify tourist attractions and services, and adjust current development priorities and legislation to create opportunities for implementing such initiatives.

Finally, the authors would like express gratitude to the project team for guidance and for providing the opportunity to contribute to the initiative. For further questions regarding this report, please contact Livia Bizikova at 604 822 1685 or [liviab@interchange.ubc.ca](mailto:liviab@interchange.ubc.ca), or László Pintér at 204 958 7715 or [lpinter@iisd.ca](mailto:lpinter@iisd.ca).

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<sup>1</sup> <http://www.balatonregion.hu/bap>

## Executive Summary

The rising number of weather and climate-related disasters causing loss of life and escalating property damage has alerted public and private sectors to the urgent need to adapt to climate change. In this report, we adopt the IPCC (2007a) definition of adaptation, which defines the term as an adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects that moderates harm or exploits beneficial opportunities (IPCC, 2001).

The purpose of the report is to outline the diversity of views that stakeholders hold about necessary adaptation options in responding to climate change. The report outlines stakeholders' past and current experiences in taking adaptive action and investigates the basic needed capacities of the involved stakeholders to successfully implement options that may be needed in the future.

This report summarizes the outcomes of a series of workshops with local stakeholders conducted between October 2007 and February 2008. Four workshops were held in three different towns located around Lake Balaton: two were held in Siofok and one each in Keszthely and Balatonalmadi. During the workshops, different techniques were introduced to gather and discuss information about experiences and the feasibility of adaptation options. These techniques included surveys, focus groups, group work and general discussions. Approximately 18 -32 stakeholders participated in each workshop.

Participants identified the following specific recommendations for local adaptation options for local businesses:

- Promote sustainable development projects that reintroduce traditional local knowledge and practices;
- Develop schemes to inform and support water conservation initiatives, increase rates of recycling, conserve energy and introduce environmentally friendly construction materials;
- Diversify types of tourist attractions and services for different target groups available regardless of the weather conditions;
- Review and adjust current development priorities, legislation, policies and standards to create opportunities to implement the adaptation measures, including those that aim to reintroduce traditional local knowledge and practices;
- Promote education, training and information dissemination among local populations, non-governmental organizations, decision-makers and businesses about how to include responses to climate change within their development decisions.

These recommendations provide significant development opportunities for local stakeholders to improve quality of life, services to tourists and the quality of local environments. They create local development benefits and increase capacities for adaptation to climate change and in this way, present ‘win-win’ responses to climate change.

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## 1. Introduction

The rising number of weather and climate-related disasters causing loss of life and escalating property damage has alerted public and private sectors to the urgent need to adapt to climate change. Slowing down, stabilizing and eventually reversing the process of climate change will require addressing its root causes (e.g., emissions of greenhouse gases or deforestation) through a wide range of mitigation measures. In the shorter term, however, mitigation will have to be complemented by adaptation to address climate change impacts that are already unavoidable due to the inertia of atmospheric processes.

In this report, we adopt the IPCC definition of adaptation, which understands adaptation as an adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects that moderates harm or exploits beneficial opportunities (IPCC, 2007a). We complement this understanding of adaptation with the additional perspective that both vulnerability and adaptation typically take place in the context of a wider range of multiple, interacting forces of change that in almost all cases go beyond climate change.

During recorded history and before, the Lake Balaton region was subject to many shifts in local and regional weather and climate patterns. The changes associated with global climate change are unique, however, not only in the sense that they are anthropogenic in origin, but also in terms of their fast pace and the amplitude of change. While weather events and climatic shifts in the past are not perfect analogues for what is expected in the future, past coping and adaptation measures by local individuals and communities can serve as a baseline and inform us about how to strengthen adaptation capacity in the future.

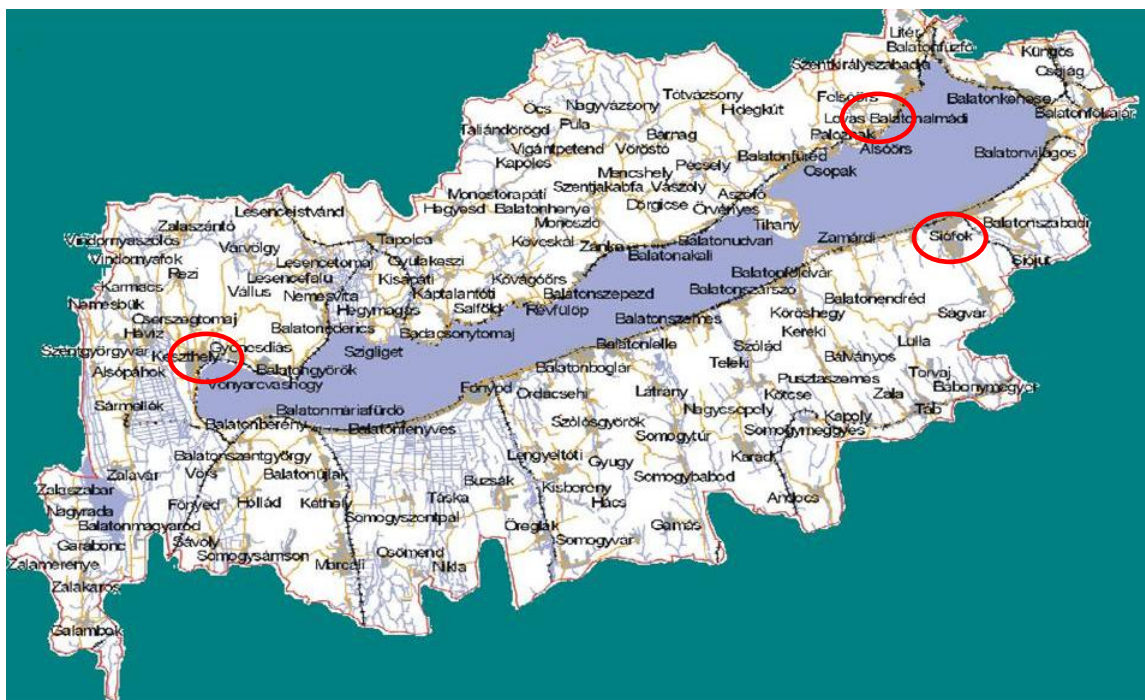
### Characteristics of Lake Balaton region

Lake Balaton is located in central Europe, in the western part of Hungary. Lake Balaton, with a surface area of 588,5 km<sup>2</sup> and average depths of only 3,3 m, is predominantly a shallow lake that is highly sensitive to changes in weather patterns, ecological impacts and management decisions. The typical local climate includes moderately wet continental weather, which significantly influences the lake's water level. The years 2000 to 2003 were characterized with lower precipitation levels resulting in lower than normal water levels (Gorlach and Kovacs, 2006). Based on 81 years of records, a long-term precipitation average is about 687 mm/yr; in 2001, on the other hand, the average level of precipitation was approximately 557 mm and in 2002, it was only 445 mm. During these years, higher temperatures resulted in increased evaporation, with a negative impact on water levels (Bouchard, 2005; Puczkó and Rátz, 2000; see also figure 1).

The municipalities around Lake Balaton formed a separate Lake Balaton Recreational Area (LBRA) focused mostly on the tourist industry. This region represents the highest share of the tourist industry in the country's economy and also has the highest-proportion (approx. 26%) of Hungary's total number of hotels, which are concentrated around the lake. In 2005, there were about 8,900 tourism enterprises operating in the region, a number that represents a gradual increase but that is still below the 1999 level of 1,120 enterprises. In 1999 the region's tourism industry generated 5.10<sup>12</sup> EUR in revenues (Puczkó and Rátz, 2000).

Public participation techniques were used to obtain information about feasible local-level adaptation options. These included a pre-workshop survey, focus groups and group discussions in a workshop setting with key stakeholders such as policy-makers, agricultural producers and business people.

**Figure 1. Map of the Lake Balaton Recreational Area Workshop locations are marked by red circles.**





## 2. Characteristics of adaptation to climate change

Adaptation to climate change is defined as, “[an] adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities” (IPCC, 2007a). There is increasing recognition that the world’s current progress in reducing greenhouse gas emissions is not occurring rapidly enough to avoid impacts from climate change in the coming century. Because of this, the world is “committed” to a certain level of global warming and therefore to a degree of impacts that will require adaptive responses by nations and communities.

We can distinguish many types of adaptation options, including anticipatory and reactive (Jones et al., 2007); supply-side and demand-side (Mills, 2007); top-down (national or global scale) and bottom-up (specific place-based assessment); and autonomous and non-autonomous (planned) (Wilbanks et al., 2007). Adaptation measures can occur at population, community, personal, or production system levels (Ravindranath, 2007). These categories are not mutually exclusive, however, and any one adaptation option could be part of more than one category at the same time. Some examples of each type of adaptation response are listed in Table 1.

**Table 1. Examples of various types of adaptation options, including the level of involvement required to develop and implement the adaptive measures**

Type of adaptation	Example	Level of involvement
Anticipatory	Diversifying rainfall removal by promoting rainwater storing, permeable surfaces and drainage pipelines	Community and individual
Reactive	Expanding drainage infrastructure to accommodate heavy precipitation events	Community
Supply-side	Building water reservoirs to collect rainwater	Community and production systems
Demand-side	Introducing water-metering to support water conservation	Community and individual
Top-down	Changing national standards, such as building codes, to address changes in climate	National
Bottom-up	Developing community by-laws to regulate building construction, such as requiring increased habitable space, and increased areas of permeable surfaces to minimize pressure on sewage systems and prevent flooding	Community and production systems
Autonomous	Facilitating farmer decisions to change timing and plant species based on observed weather changes	Individual and community
Non-autonomous (planned)	Changing water resources allocation to ensure biodiversity protection, and agricultural and drinking water supplies	Community, production systems and individual

In the global climate change discourse, greenhouse gas (GHG) mitigation and climate change adaptation strategies have generally been considered as separate, and even mutually exclusive, activities (Dang et al., 2003). There is increasing recognition, however, that both mitigation and adaptation efforts may make perfect sense for a society in order to decrease climate risks and capture co-benefits (Swart and Raes, 2007). A society's capacity to adapt or mitigate also depends on similar factors, such as the range of available technologies, the availability and distribution of resources, and the structure of critical institutions, etc. (Yohe, 2001). These factors are deeply embedded within development decisions, pointing to the need to consider integrated adaptation and mitigation responses (Burch and Robinson, 2007).

Linking mitigation and adaptation at the local level is likely to highlight interactions between these two types of climate change actions. Mitigation measures can increase local vulnerability to climate change, and measures for adaptation can likewise increase local GHG emissions—unless they are considered together. For example, efforts to reduce GHG emissions could include concentrating housing developments close to a town centre (to use energy more efficiently and reduce emissions), while an adaptation strategy could dictate that if the town centre is located close to a river prone to flooding, it would be desirable to locate new housing sufficiently far away from the centre (Naes et al., 2006).

During the workshops, we paid special attention to identifying adaptation options that do not create more of the GHG emissions that contribute to climate change.

### 3. Methodological approach

Between October 2007 and February 2008, a series of workshops were conducted with the participation of local stakeholders to gather information about experiences with adaptation practices in the past. Two workshops were held in Siófok, and one each in Keszthely and Balatonalmádi. During the workshops, different techniques were used to gather and discuss information about experiences and the feasibility of adaptation options. These techniques included a survey, breakout-group work and plenary discussions. Approximately 18 to 32 stakeholders participated in each workshop. Particular attention was paid to identifying adaptation options with positive biodiversity impacts.

The workshop objectives were the following:

1. Discuss how participants historically and currently handle(d) risks and opportunities arising from a changing climate;
2. Have participants assess their current capabilities to address potential future needs resulting from progressing climate change impacts;
3. Explore what types of sectoral and institutional measures stakeholders feel would be required to facilitate the integration of adaptation actions into local projects and practices.

**Table 2. Affiliation of the participants of the four workshops in the Lake Balaton region**

	Siófok	Balatonalmádi	Keszthely	Siófok	Total by category
Municipalities	2	2	2	6	12
Environmental protection authorities	2	5	0	5	12
Farmers' associations	7	0	4	5	16
Civil society organizations	6	6	6	8	26
Education	1	3	5	5	14
Regional Agencies	0	3	1	3	7
<b>Total</b>	<b>18</b>	<b>19</b>	<b>18</b>	<b>32</b>	<b>87</b>

## 4. The changing climate around Lake Balaton

There is consensus among leading international scientific institutions that climate change is occurring and is driven by anthropogenic activities. In addition to an increase in global average surface temperatures, the frequency and intensity of extreme weather events, including droughts, heavy rain and snowfalls, floods etc., has increased and are expected to further increase in the foreseeable future regardless of how rigorously emission reductions policies will be implemented (IPCC, 2007a).

Information about observed changes in climatic and weather patterns and about experiences in responding to them could provide a good basis for developing a list of options for future adaptation measures. In both the pre-workshop survey and during the workshops, participants confirmed that changes in weather patterns are occurring and responses are needed. The changes observed by participants included heat waves, changes in the growing season, changes in Lake Balaton's water level and changes in winter precipitation and temperature. Overall, more than 75% of participants experienced weather events they believed could be linked to the local manifestation of global climate change. According to projections, many of these events are expected to intensify over the next decades (IPCC, 2007b; VAHAVA, 2006).

Based on their experience over a few decades, participants in all workshops observed pattern shifts in weather and climate that go beyond the normal range of variability. The most significant is the increase in summer peak temperature, which is now in the +40°C range and severely limits many forms of outside activities. The increase in temperature was seen as a major barrier for agricultural activities and as a factor that could decrease the attractiveness of the region for tourists. The second-most important observed impact was changes in the amount and intensity of rainfall. Participants observed a decrease in the overall number of rainy days during the summer seasons, and at the same time, an increase in extreme rainfall events. Changes in the amount of snow were also accompanied by earlier snowmelt. For an overview of observed changes, see Table 3.

The observed changes in climatic variables led to changes in the character of weather seasonality, perceived as shorter spring seasons and earlier summers. These changes led to water shortages for agricultural production and high losses in water availability due to heavy rains flowing directly into drainage systems instead of storing it for later use. As a result, pressures on local drainage systems increased as did erosion. Changes in summer temperature and rainfall led to more droughts in the region. Increased temperatures have affected human health by putting a growing number of elderly at risk (Table 3 presents a detailed overview of observed impacts).

Participants rarely had direct experience of the impacts of climate change on biodiversity. They observed higher levels of disturbances, such as outbreaks of insects and new parasites; however, they

also acknowledged that these impacts could be due to inappropriate species selection by farmers. They also observed changes (generally an increase) in the trend toward an earlier start in the vegetation season with climate change. In terms of natural ecosystems, they expect a potential rearrangement of ecosystem structures, functions and services and degradation in species that are not able to sustain themselves under changing conditions. This is especially valid for introduced species and highly sensitive local species in disturbed and limited habitats.

**Table 3. List of observed climate and weather related impacts reported during the workshops**

Observed changes	Observed impacts in the Lake Balaton Recreational Area (LBRA)
Increases in temperature	Health impacts related to extreme heat (heat stroke, for example), storm-related fatalities/injuries, infectious diseases Potentially growing risks to the elderly, who are more vulnerable to extremes Increase in respiratory illnesses and allergies due to pollen, ozone and other factors exacerbated by weather conditions Negative impacts on tourism, as current activities are generally focused on spending time on the beach
Changes in precipitation	Shifting volume, intensity and timing of precipitation, and decreased snowfall Current limited adaptive capacity of agriculture to climate variability/change, given its sensitivity to rainfall variability Critical water and heat stress on newly established vineyards Overflow of sewage systems and blockages during extreme storm events Quick water runoffs due to paved surfaces Increased erosion Sensitivity of lake water levels to precipitation extremes (both low and high)
Combined impacts of changes on biological diversity	Disturbances such as wildfire and insect outbreaks are increasing and are likely to intensify Changes in vegetation growth with changes in climate Potential rearrangement of ecosystem structures, functions and services (e.g., shifts in vegetation types) Promotion of heat and drought tolerant species to increase their adaptability to changing conditions Increases the amount of blue algae in the lake Changes in the species composition of fish populations

## 5. Adaptation to climate change in the Lake Balaton area

### 5.1 Historical and current adaptation strategies

In general, participants supported the idea of developing responses to climate change, especially those that also address current development challenges. This positive attitude is probably due, in part, to the relatively good level of participants' knowledge about climate change, including the current state of science at both global and local levels. One of the workshop methods used country-specific and local datasets to link global climate change to local-level impacts. This exercise was very helpful in stimulating participant interest and motivating them to think about adaptation. Table 4 provides an overview of the key adaptation options identified during the workshop.

Some of the participants already had experience with adaptation measures that are linked to their current management decisions. Climate change influenced some these decisions, but it was not the major driver.

With regard to *agriculture*, vineyards are a key part of the sector and their vulnerability and adaptation are of significant interest. Participants listed adaptation options in viticulture, such as rainwater storage, to cope with water shortages during drought; mixed-species plantations that include more drought-tolerant species; and changing planting times and creating terraces for new plantations to minimize erosion and retain water. With regard to labour practices and reducing human-health hazards, adaptation measures also included changes in times working in the fields, with earlier start-times and breaks during lunchtime when temperatures are the highest.

In terms of the *tourism* industry, a limited number of adaptive measures have been applied so far. Although participants observed changes in the number and types of tourists during periods of lower water levels between 2002 and 2003, they did not implement specific measures to address this change. The lower water level affected the types of tourists, as participants noted that to a certain degree, families with small children tend to welcome reduced water depth. Participants from Siófok reported that they would prefer more family-friendly development strategies, which lead to a discussion about how to introduce future measures that could make the LBRA attractive to this type of tourism in the context of a changing climate.

Participants were very interested in promoting local traditional *building materials and construction practices*. Most of their past experience was related to home insulation to minimize heating costs in the winter and maintain cooler temperatures during the summer. There is also interest in and knowledge about alternative (renewable) energy production and its integration into construction and renovation projects. This included using reed and solar collectors in residential buildings. Participants reported that many of these opportunities remain unexplored, however, partly

because current legislation and building codes do not make provisions for their use. Financial incentives, other support schemes and information are needed to educate residents, developers and builders about alternative building and energy system options.

According to participants, the most common trigger for adaptation measures was expected or real economic losses. Economic impacts due (partly) to climate change represent an additional stress on the region, which is still struggling to cope with the consequences of a problematic socio-economic transition in the 1990s. Short-term cost-benefit ratios send strong signals to stakeholders when they are considering future response options, although in some cases it is hard to separate economics, broader environmental issues and climate change as motives behind the decisions. Generally speaking, however, stakeholders would not normally implement adaptation options unless they provide a return on investment in the foreseeable future.

Although the model has been applied mostly to developing countries, there are clear symptoms in the Lake Balaton region of a *double exposure* to the effects of both economic globalization and climate change. According to this model, the impacts of climate change combine with stresses arising from the consequences of economic globalization that already strain local institutions (O'Brien and Leichenko, 2003). The corollary of this model is that adaptive measures need to be developed with the cumulative effects and interlinkages of these two major forces of change in mind.

**Table 4. Summary of adaptation options currently implemented in the region, as identified by stakeholders**

Areas of focus	Applied adaptation options
Agriculture and vineyards	Rainwater storage to alleviate the effects of drought Diversification of crop varieties and/or species Adjustment in planting schedules Increased water retention by terrace development in vineyards Adjustment of daily work schedules to avoid exposure in mid-day when heat stress is highest
Alternative energy and construction	Improved insulation of buildings House design to balance natural light and energy conservation Use of natural materials such as reed in roof construction Use of biomass in energy production
Water use and sewage treatment	Rainwater storage and use for irrigation in kitchen gardens Small-scale, decentralized sewage treatment Increased efficiency of irrigation systems
Tourism development	Introduction of daily beach tickets with the possibility of multiple entry



## 5.2 Options for future adaptation measures

During the workshop, participants discussed a range of potential activities that could be applied in the LBRA to promote both adaptation to a changing climate and at the same time, sustainable development. Many of these options are based on experience with adaptation measures over previous years.

In general, participants were interested in considering adaptation options to the changing climate as a part of their overall development plans. This interest was indicated even in the survey conducted prior to the workshops. Participants did not exactly view climate change as an opportunity, but they welcomed many of the identified adaptation options because they encourage sustainable development in the region, which is needed nonetheless. Table 4 presents an overview of potential future adaptation options identified by participants.

Most of the future adaptation options identified focused on implementing different conservation practices, including rainwater storage, higher rates of recycling, and energy savings measures, as well as increasing the utilization of renewable energy. Some of these activities were seen as small-scale measures that can be implemented locally without significant investment. A more systematic, region-wide expansion of these activities, additional information, and in some cases an expansion of municipal services is needed, however. Examples include the development of recycling facilities or adjustments in the management of sewage infrastructure if some of the rainwater is diverted into retention facilities. The situation is different for renewable energy sources, where participants clearly indicated the need for significant government support—potentially up to 70- 80% of installation costs.

Regarding tourism, participants did not see a strong need for adaptive measures directly in response to a changing climate. They were more concerned about redirecting development towards family-oriented and higher quality tourism that values local traditions and ecosystems compared to current practices focused on mass tourism and expanding the built-up areas around the lake. They identified options such as the establishment of community centres for daytime activities for children; involvement of local wineries in the development of cultural programs; proper maintenance, improvement and expansion of the bicycle path around the lake; and spa development that can attract tourists year-round. It was also mentioned that it is important to provide activities for ecotourists, who are concerned about protecting the local environment and biodiversity and shun the use of motorbikes and boats with polluting engines. Such activities could include horseback riding, hiking, cycling, windsurfing and sailing.

There was also a high interest in promoting eco-friendly and traditional materials in building new tourist facilities. As the participants pointed out, however, all infrastructure should not be located at the waterfront; rather, some of the new initiatives could be targeted towards communities located



further away from the shoreline of the lake. Similarly, background communities could be more involved in providing local food grown in their gardens. Promoting the use of locally produced food and organic food and wine in local restaurants could help increase the uniqueness of the region. Devoting greater support to background communities could also help in easing the pressure on the local transportation network by redirecting traffic to other villages around the lake.

Participants listed many opportunities to promote the wider use of environmentally friendly construction materials using new technologies but also reintroducing traditional building practices and materials, such as reed. The use of local reed could also increase the economic value of reed beds, which would simultaneously improve the value of different types of ecosystem services, including provisioning (reed), cultural (return to more traditional land-use) and regulating services (natural habitat for vertebrates and invertebrates; water quality control). Participants explicitly mentioned the need to educate planners and homebuilders about these opportunities. There is also a need to revise building codes, since some of the environmentally friendly construction materials or practices (new or traditional) are not included and represent a major institutional hurdle. Sustainable adaptation measures, such as the use of heat pumps, solar heaters and insulation need to be actively promoted and made economically advantageous, otherwise there is a real risk of maladaptation, such as the widespread use of air conditioners, which is already occurring. Future adaptation options were identified in the context of other, broader development choices. Many of these options, however, require financial support, changes in standards and legislation, and information and training for builders and planners.

Overall, the cost of the various adaptation options was seen as a key criterion for their selection. Another key precondition for the successful introduction of adaptation measures was collaboration and communication among local, regional and national actors. Participants reported that often there is a lack of trust among key actors and limited experience with cooperation. As climate change represents an additional challenge that requires collective action, investments could be made in local institutions and processes that build trust and cooperative endeavours. Participants usually identified adaptation options that are based on individual initiatives and on direct support from the central government or the EU, indicating a weak tradition in cooperation.

**Table 5. List of future adaptation options to a changing climate, as identified during the workshops**

Areas of focus	Potential future adaptation options
Agriculture and vineyards	<p>Increased rainwater storage capacity to respond to the drought season;            Increased diversity of planted crop varieties and species, including heat and drought tolerant ones;            Increased emphasis on planting native and traditional species and varieties;            More widespread use of mulching and permanent cover to increase moisture retention in soils;            Introduction of shade-producing plants to create sun shelters during heat waves;            Increased efficiency of irrigation techniques;            Adjusted planting schedules;            Expansion of terraces for new vineyards to retain rainwater longer;            Earlier starts for workers in the morning and longer breaks during lunchtime, when the temperature is the highest;            Promotion of water and energy saving measures in new buildings.</p>
Alternative energy and construction	<p>Better insulation of buildings;            Better allocation of rooms to maximize warmth and light in homes;            Installation of passive or active solar panels;            Use of waste biomass for energy production;            Introduction of energy saving programs;            Provision of better information about environmentally friendly building materials;            Promotion of traditional materials and practices in construction;            Construction of tourist facilities that use renewable energy.</p>
Water usage and sewage system	<p>Rainwater storage infrastructure and rainwater use for watering gardens;            Water saving toilets (dual-flush options);            Small-scale sewage treatment facilities;            Increased use of permeable surfaces instead of solid concrete to facilitate groundwater recharge.</p>
Tourism development	<p>Maintenance and expansion of bicycle paths;            Cleaning and maintenance of hiking trails;            Providing better bus / train services to interesting sites around the lake;            Building community centres with covered play areas for children;            Using daily beach tickets with the possibility of multiple entry;            Publicizing alternative activities to swimming during bad weather;            Building eco-friendly tourist facilities by using traditional materials;            Promoting local and organic food production and their use in restaurants during the tourist season;            Expanding tourist facilities and 'home-stay' in villages around the lake and villages inland from the lake;            Promoting ecologically friendly recreational activities, including horse-back riding, hiking, cycling, and windsurfing (instead of the use of gas-powered vehicles such as motorbikes and boats).</p>
Information and education	<p>Use educational films from other countries or produce and use similar materials that portray Hungarian conditions;            Support adaptation pilot projects and disseminate experiences;            Exchange experiences with foreign partners who have undertaken similar adaptation measures;            Prepare information packages about potential adaptation measures to different target groups (decision-makers, planners, designers, teachers and the public).</p>

## 6. Short and long-term implementation priorities for local adaptation

In terms of potential implementation, future adaptation options may be considered at different time scales. Short-term “no regrets actions” are those in which society would benefit from implementation even if anthropogenic climate change did not take place (IPCC, 2001). The focus of short-to-medium term actions should be on addressing current pressing vulnerabilities. These options often address problems with current weather-related events.

Participants identified the following short-term adaptation options as priorities:

- Address preferred options (often win-win solutions) that are supported by consensus within the project team;
- Make use of ‘Low-hanging fruit,’ including responses that require minimal effort and are easy to implement;
- Focus on an area or areas of the highest urgency (if applicable), to minimize major impacts on the most vulnerable parts of the community;
- Tackle situations that provide ‘no-regret’ options, which help to address current and anticipated future problems and issues that need to be dealt with anyway.

Longer-term adaptation actions are those that would focus in particular on building a resilient community and promoting sustainable development alternatives, thereby increasing the community’s adaptive capacity. It is also important to maintain an on-going list of long-term measures, which allows potential adaptation and/or mitigation options responding to climate change to be added for future implementation, depending on future conditions that are presently uncertain (Willows and Connell, 2003).

Potential specific, short-term adaptation options:

- Planting species that are native to the locality;
- Increasing the efficiency in irrigation (including small-scale actions);
- Promoting water and energy saving measures in new buildings and retrofitting existing buildings to conserve water and energy;
- Revitalizing the bicycle path around the lake;
- Promoting local and traditional food production in the region for tourists;
- Introducing regulations that support the expansion of green spaces and specify the types of trees planted;
- Developing communication and capacity-building strategies on a collaborative basis.

These measures were identified by workshop participants as the most feasible to implement. Participants mentioned that some of these measures are already being implemented but as yet, only by individuals on a small scale. Most of these options will not require extensive funding support and some of them will provide direct cost-savings for those who implement them. At this stage, efforts should be started to develop an area-wide communication and capacity building strategy that would be implemented in the coming years.

Potential medium-term adaptation options:

- Expanding public transport services to tourists and locals;
- Introducing initiatives to restore shorelines so they absorb potential stresses from climate change and provide habitat for species;
- Expanding shore development for tourism, balanced with flood protection measures;
- Implementing pilot projects to promote new construction materials and conservation options;
- Expanding the public transportation network to increase the region's accessibility, especially to background communities further away from the lake;
- Developing a pilot initiative targeted to background communities to accommodate tourists, so as to decrease pressures on the sensitive shoreline;
- Initiating a pilot project on green and eco-friendly tourist facilities to demonstrate their local feasibility;
- Discussing and developing a local food security strategy in the community

These measures are closely linked to the sustainable development priorities currently identified in the area. Although already 'on the radar', many of these measures would also require policy support, some level of start-up funding and pilot projects to show the feasibility of these options to local people and businesses. The medium-term options offer opportunities to build on the lessons learned from the short-term options, including capacity-building, and to prepare the ground for long-term options, such as promoting ecologically-friendly tourism, local food security, shore protection and strengthening the role of background communities.

Potential long-term adaptation measures at the local level:

- Promoting new standards, which would also require subsidies to support their implementation. Examples include types of renewable energy and the use of reed and traditional construction materials;
- Making a long-term commitment to a restricted land-use policy to limit the shore expansion of infrastructure, which would help protect natural buffers to flooding;
- Expanding the public transport system and other 'greener' local transportation methods;

- Expanding tourism beyond the main season, with significant benefits for local communities around the lake;
- Introducing or expanding ecotourist activities that focus on long-term biodiversity and natural resource conservation.

These responses include measures that should help build long-term resiliency in communities so they are able to cope with future vulnerabilities, including climate change. Such responses are directly linked to the promotion of local sustainable development, including economic and social priorities that benefit communities at the same time as they conserve natural resources and biodiversity. This should help the region build the capacity needed for local resilience.

## 7. Conclusions and recommendations

The impacts of climate change are occurring at the same time as other socio-economic change takes place in the Lake Balaton region. This situation of ‘double exposure’ imposes significant pressures on small-business owners, municipalities and farmers. Many of these stakeholders have adjusted their operations in an attempt to stabilize the socio-economic and environmental conditions they face. Such ad hoc responses have little capacity to build resilience or to address changes outside of the assumed ‘normal’ range of variability. Given the still recent—and in many ways incomplete—transition from a centrally planned economy, economic and social safety nets have been weakened or have disappeared, while alternative systems have not yet evolved. This makes individuals, public institutions or businesses vulnerable to shocks.

Workshops participants were aware of many options that can help minimize the impacts of climate change, such as collecting rainwater, introducing better construction practices and using terraces to reduce water loss. They also noted that in addition to small-scale measures that individuals can take on their own, there are other adaptive measures that would require more thorough planning and financial support, such as developing solar energy systems, changing drainage methods, building community centres to provide alternative programs and activities for tourists during inclement weather events, and introducing reforestation activities. Participants were aware of adaptation measures that can help improve local biodiversity. Some of these, such as better care and expansion of reed beds, afforestation or diversification of crop varieties, can have direct positive impacts on biodiversity (either in natural or agro-ecosystems). Others have an indirect, though still positive impacts, such as expanding the infrastructure for environmentally friendly tourism, public education, or the use of local, traditional building materials. A regional program to introduce measures that address both climate change impacts and sustainable development could benefit not only local communities but also serve as a model for Hungary and other countries in the region.

Based on discussions during the workshops, the options for local adaptation can be summarized as follows:

- Promote the reintroduction of traditional local knowledge and practices e.g., in agriculture and the construction industry;
- Develop programs to inform and support water conservation initiatives, increased rates of recycling, energy conservation and the use of environmentally friendly construction materials;
- Diversify the type of tourist attractions and services for different available target groups, regardless of the weather, and expand the range of activities beyond the main tourist season;

- Review and adjust current development priorities, legislation, policies and standards to create the necessary framework conditions and capacity for implementing adaptation measures, including those that aim to reintroduce traditional local knowledge and practices;
- Promote education, training and information dissemination aimed at the local population, non-governmental organizations, decision-makers and businesses on how to integrate responses to climate change into strategic planning and development decisions.

These recommendations are meant to provide significant development opportunities for local stakeholders to improve quality of life, provide better quality services to tourists and enhance the quality of the local environment. They create local development benefits and increase capacities for adaptation and in this way generally present ‘win-win’ responses to climate change.

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## Appendix I Workshop agenda for all workshops conducted around Lake Balaton

Workshop Agenda	
8:30 – 9:00	Registration and coffee
9:00 – 9:15	Welcoming speech and general objectives <i>Dr. Molnár Gábor (Balatoni Integrációs Kht.)</i>
9:15 – 9:40	<b>Topic 1: Localizing climate change</b> Introducing climate change, impacts and scenarios <i>Dr. Pintér László (IISD, Kanada)</i>
9:45 – 10:15	Adapting to climate change at the local level <i>Dr. Livia Bizikova (Environment Canada és IISD, Kanada)</i>
10:15 – 10:30	Coffee break
10:30 – 10:50	Making climate change relevant to local level <i>Kutics Károly (K+F Consulting Kft.)</i>
10:50 – 12:00	<b>Topic 2: Adapting now</b> <u>Experiences with climate change and adaptation in the past and present</u> (focus group) Wrap up: Sharing list of adaptation options between groups
12:00 – 13:00	Lunch
13:00 – 13:20	Perception of climate change by local decision-makers <i>Dr. Anna Vari (Hungarian Sociological Institute)</i>
13:20 – 14:00	<u>Outlining future climate change impacts and discussing future adaptation</u> Group activity – brainstorming session Wrap up: Sharing list of adaptation options between groups
14:45 – 15:00	Coffee break
15:00 – 15:45	<b>Topic 3: Opportunities for adaptation in the future</b> Group discussion about the adaptation options and needed support to implement them Wrap up of the outcomes
15:45 – 16:00	Closing

## Appendix II List of workshops' participants

October 26<sup>th</sup> 2007, Siófok

Areas of focus	Participating organizations	Number of participants
Municipalities	Bábonygyer Község Önkormányzata	1
	Siófok Város Önkormányzata	1
Environmental associations	MBFH Pécsi Bányakapitányság	2
Farmers associations	Balaton-Parti Fenntartó és Hasznosító Kft.	2
	PMT GmbH	1
	ÖKO-WORK Kft.	1
	MIR Bt.	1
	DRV Zrt.	1
	Csikóréti Ökogazdaság	1
Civil society organization	Észak-Somogyi Vízi Társulat	1
	Városvédő és Szépítő Egyesület	1
	RÉSZKÖE Közhasznú Egyesület	3
	Nők a Balatonért Egyesület	1
Education	VITUKI Kht. Oktatási Központ	1
		Total number of participants 18
Local organizers	KHT and IISD	5
		<b>Total 23</b>

December 10<sup>th</sup> 2007, Balatonalmádi

Areas of focus	Participating organizations	Number of participants
Municipalities	Veszprém Megyei Önkormányzat	1
	Balatonalmádi Város Önkormányzata	1
Regional agencies	Balatoni Integrációs Kht. Társadalomtudományi Kutatócsoport	3
Environmental associations	Veszprém Megyei Mezőgazdasági Szakigazgatási Hivatal (Növény és Talajvédelmi Igazgatósága)	2
	Magyar Állami Földtani Intézet	1
	Veszprém Megyei Katasztrófavédelmi Igazgatóság	
Civil society organization	Nők a Balatonért Egyesület	1
	Veszprémfajszer Egyesüle	1
	Balatonfüredi Yacht Club	1
	Csopak Környéki Borút Egyesület	1
	Édesvíz Természetbarát Egyesület	1
	Balatonparti Fürdőegyesületek Szövetsége	1
Education	Magyar-Angol Tannyelvű Gimnázium	3
		Total number of participants 19
Local organizers	KHT and IISD	5
		<b>Total 24</b>

December 11<sup>th</sup> 2007, Keszthely

Areas of focus	Participating organizations	Number of participants
Municipalities	Lesenceistvánd Község Önkormányzata	2
Regional agencies	Tapolca és Környéke Többcélú Kistérségi Társulás	1
Farmers associations	Dunántúli Regionális Vízmű Zrt.	1
	Laposa Pincészet	1
	Fonyódi Ásványvíz Zrt.	2
Civil society organization	Hévízi-tó Alapítvány	1
	Zala Megyei Természetbarát Szövetség	1
	Kisbalatoni és Zalamenti Vízitársulat	1
	Nők a Balatonért Egyesület	3
Education	Asbóth S. Térségi Középiskola,	1
	Pannon EgyetemGeorgikon	4
		Total number of participants 18
Local organizers	KHT and IISD	4
		<b>Total 22</b>

October 26<sup>th</sup> 2007, Siófok

Areas of focus	Participating organizations	Number of participants
Municipalities	Bábonymegyer Község Önkormányzata	1
	Siófok Város Önkormányzata	2
	Veszprém Megyei Önkormányzat	2
	Balatonalmádi Város Önkormányzata	1
Environmental associations	MBFH Pécsi BányakapitányságHivatal (Növény és Talajvédelmi Igazgatósága)	2
		2
	Magyar Állami Földtani Intézet	1
Farmers associations	Balaton-Parti Fenntartó és Hasznosító Kft.	1
	PMT GmbH	2
	ÖKO-WORK Kft.	1
	MIR Bt.	1
Civil society organization	Észak-Somogyi Vízi Társulat	1
	RÉSZKÖE Közhasznú Egyesület	2
	Nők a Balatonért Egyesület	3
	Hévízi-tó Alapítvány	1
	Zala Megyei Természetbarát Szövetség	1
Education	VITUKI Kht. Oktatási Központ	3
	Pannon EgyetemGeorgikon Mezőgazdaságtudományi Kar	1
		1
		Total number of participants 29
Local organizers	KHT and IISD	3
		<b>Total 32</b>