



Interreg



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Danube Transnational Programme

CAMARO-D

Transnational best management practice (BMP) catalogue – SPATIAL PLANNING

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1 Introduction

Catalogue of Best Management Practices was created as a result of Interreg Danube Transnational Program project CAMARO-D, dealing with flood control, water quality and related questions of land management in Danube catchment.

Catalogue is presented in the form of four issues/handbooks, according to focus area in land management. The focus areas are:

- Agriculture – arable land;
- Agriculture – grass management;
- Forestry;
- Spatial Planning.

Prior the catalogue creation the BMP transnational synthesis had been worked out by CAMARO-D project in close cooperation of all project partners. The synthesis was the first catalogue input offering comparison of BMP use in Danube countries.

Then four international expert teams in above listed focus areas worked out final selection and qualified description of measures to be included in the BMP catalogue.

The catalogue therefore neither collects and assesses all practices, applied within water and landscape management in partner's countries, nor lists practices most often recently applied within individual Danube countries.

It summarizes most effective practices applied and practices rarely (or even not yet) applied, but which application is highly desirable in several Camaro-D countries. The authors are aware that there exists number of other practices that can be effectively applied within individual countries.

The list will never be complete, but catalogue tries to collect the most effective and most often implemented practices to share knowledge and experiences within Danube countries.

All four issues of BMP catalogue have standardized structure for better orientation and includes indicative criteria as frequency of recent implementation within individual countries, effectiveness and cost demand of general support from state, EU or other legislation.

According to the title the catalogue deals with Management Practices, but it describes also Technical Measures. Practice or Measure are understood generally as any activity, leading to improvement of water management within target area of Danube catchment.

Hopefully our target group consists of decision makers, land managers, stakeholders, and local authorities interested in Danube region landscape improvement.

1.1 List of Best Management Practices – Spatial Planning

- Protection of (water-related) open spaces in regional and local land use planning
- Integration of flood hazard information into regional and local land use planning
- Implementation of retention pits and local rainwater harvest facilities in local land use plans
- Coordination of flood risk management at catchment scale
- Implementation of land-saving development measures
- Awareness raising for land-saving development and flood adaptation by participatory local land use planning processes
- Land management for river restoration and flood protection
- Implementation of nature conservation and water management projects in land consolidation schemes

2 Best Management Practices - catalogue

2.1 Protection of (water-related) open spaces in regional and local land use planning

Type of practice/measure		
Technical	Management	Other - specify
	X	

Description of practice/measure
<p>The protection of open spaces (in the sense of undeveloped land) is a planning measure, usually applied in regional or local land use plans. The basic principle of this measure is to define high value open space land uses, such as nature conservation, recreation, flood protection, water quality conservation or agriculture, and assign them priority in the land use planning process (e.g. agricultural priority zones). These areas not eligible for zoning building land or other land uses that could harm the purpose of their designation (e.g. infrastructure development, gravel mining). Related to water management flood hazard areas, flood plains with retentive functions or reserve areas for structural flood protection or groundwater protection could be given this kind of priority.</p>

Intended goals of practice/measure
<p>The goal of this measure is to provide the spatial preconditions for flood runoff ("room for the river") and water quality conservation. Furthermore, this management practice contributes to the protection of anthropogenic land uses against the impacts of flooding and to soil conservation in general.</p>

Characteristics of practice/measure

This measure is suitable for land use planning systems with a zoning approach (land use options and restrictions according to different zones in land use plans). It requires information about flood hazards (e.g. flood hazard maps), important aquifers and soil qualities.

Effectiveness in operation

Provided that land use planning has the necessary legal and political stability against particular land use interests (e.g. for zoning residential and commercial building land) the measure is very effective in various directions comprising soil conservation, flood control and water quality conservation.

On soil conservation

On flood control

On water quality conservation

Costs

Being a governmental procedure the investment and operational costs of regional and local land use planning are low compared e.g. to potential losses as a consequence of flooding. Economic losses of land owners can be substantial if land expected to be suitable for development is zoned as open space priority area. But usually justified local needs for housing and commercial development are taken into account.

Investment costs

*

Operational costs	*
Economic losses of land owner/users or other stakeholders	**

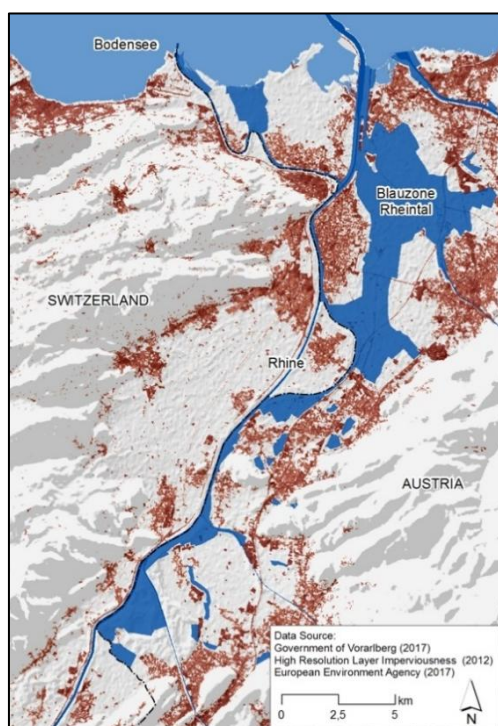
Potential problems/conflicts	
<p>This measure requires the landowners to cooperate and needs a strong political commitment for implementation. Changing the land from, for example, agricultural land to building land increases its value. So there are considerable interests to do so and not protect the open spaces. In some countries for example the areas where permanent housing is possible are limited to certain proportion of the country's territory. The best land for housing in many cases is located in valley/lowland areas leading to multiple land use demands and various land use conflicts.</p>	
Rate	**

Required or supported by governmental policies (legal framework, directives, financial incentives, other governmental programs etc.)?									
<p>Regional land use planning is supported by spatial planning laws. Governmental support is required to intensify regional land use planning and to increase the number of water-related open space priority zones.</p>									
Country	AT	BG	HR	CZ	D	HU	RO	RS	SLO
yes/no	yes			yes					

Applied in the country?

Flood protective zoning is often applied at local planning level, however, there are just few examples at regional planning level (see photo).

Country	AT	BG	HR	CZ	D	HU	RO	RS	SLO
Select level: *, **, ***	*			**					



Flood related priority zones (so called “blue zones”) designated in a regional land use plan
(Source: Government of Vorarlberg, 2017)

2.2 Integration of flood hazard information into regional and local land use planning

Type of practice/measure		
Technical	Management	Other - specify
	X	

Description of practice/measure
Flood hazard information (e.g. flood hazard maps or calculated inundation areas) is displayed in local and regional land use plans. The information should be available for everyone (e.g. in web-based land information systems).

Intended goals of practice/measure
The goal of this measure is to make hazard information available for planning stakeholders so it can be considered in planning processes at local and regional level.

Characteristics of practice/measure
Integrating flood hazard information into local and regional land use planning is important both for the local planning authority as a basis for land use planning and for the citizens in general (and land owners in particular) in order to be informed about the spatial extension of potential flood events.

Effectiveness in operation

This measure is very effective if planning stakeholders can use the information and implement it in land use plans and development concepts. This implementation should result in a lower degree of land use conflicts between flood risk management and development and thus avoid potential flood damage. Making flood hazard information available to the public also supports awareness for those hazards. If hazard information is integrated and no building land is zoned it also contributes to soil conservation (i.e. to avoid soil sealing).

On soil conservation

**

On flood control

On water quality conservation

*

Costs

Costs result from collecting and modelling the hazard data necessary and from establishing the database or GIS portal. Economic losses for land owners can be attached to not zoning building land.

Investment costs

*

Operational costs

*

Economic losses of land owner/users or other stakeholders

*

Potential problems/conflicts

Property values are affected by the location of building in hazard zones. This may intimidate land and house owners in hazard zones. Because of that local planning authorities might be reluctant to display hazard zones in local land use plans.

Rate

*

Required or supported by governmental policies (legal framework, directives, financial incentives, other governmental programs etc.)?

Country	AT	BG	HR	CZ	D	HU	RO	RS	SLO
yes/no	yes			yes					

Applied in the country?

Standard procedure in local land use planning.

Country	AT	BG	HR	CZ	D	HU	RO	RS	SLO
Select level: *, **, ***	***			***					



Flood hazard information displayed in a local land use plan (Source: IRUB)

2.3 Implementation of retention pits and local rainwater harvest facilities in local land use plans

Type of practice/measure		
Technical	Management	Other - specify
	X	

Description of practice/measure
Implementation of “green infrastructure” like retention pits and local rainwater harvest facilities in local land use plans is a measure applied by planners and local planning authorities. The measure is aimed at exploiting the potential of local land use planning in designing measures to avoid the adverse consequences of flash floods and river floods.

Intended goals of practice/measure
Local retention of rain water plays an important role in mitigating the negative impacts of flash floods and river floods. The goal of this measure is not to drain the water into the next river and thereby speed up and increase the flood wave but to keep it on site as far as possible so it can percolate or evaporate. Percolation of water is beneficial for the ground water level. Evaporation has a cooling effect which can be used to buffer heat islands in cities and heat phases in general. Local land use planning offers the possibility to preventively integrate retention pits and local rainwater harvest facilities into new housing areas and to raise awareness for small scaled local retention measures.

Characteristics of practice/measure

The measure is suitable for implementing retention pits and local rainwater harvest facilities into housing areas to be developed. Local land use planning is not suitable for implementing those measures in the existing housing stock.

Effectiveness in operation

The measure is very effective when housing development is planned on impermeable soils. Instead of building water drainage systems that can cope with heavy rain events there is the approach to plan new buildings with an integrated rainwater management, which is able to retain the water. Those areas can be regarded as green infrastructure. They can be used as playgrounds or parks and thus create an additional benefit for the area.

On soil conservation

**

On flood control

**

On water quality conservation

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Costs

Many cities already have such concepts in place, for example Hamburg or Copenhagen, and calculations showed that this kind of infrastructure is cheaper than the drainage system that would be needed to cope with heavy rain events. Furthermore, they have a lot of additional benefits which increase the value even more. The maintenance is also cheaper compared to drainage systems.

Investment costs

*

Operational costs

*

Economic losses of land

*

owner/users or other stakeholders	
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Potential problems/conflicts	
A potential problem is groundwater pollution by contaminated surface water. Local development plans where retention pits and local rainwater harvest facilities are integrated are often not compulsory. Especially in rural municipalities there are few incentives to use this local planning instrument.	
Rate	*

Required or supported by governmental policies (legal framework, directives, financial incentives, other governmental programs etc.)?									
On the one hand there is increasing support for these measures on the other hand the intensity of local development planning is quite low.									
Country	AT	BG	HR	CZ	D	HU	RO	RS	SLO
yes/no	yes/no			no					

Applied in the country?									
Country	AT	BG	HR	CZ	D	HU	RO	RS	SLO

Select level: *, **, ***	*			*					
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Local rainwater harvest facility (Source: Wikipedia)

2.4 Coordination of flood risk management at catchment scale

Type of practice/measure		
Technical	Management	Other - specify
	X	

Description of practice/measure
<p>Coordination of flood risk management at catchment scale is a measure applicable at regional, national or international level. Best management practices in this field usually relate to the regional level, mainly realized by a (voluntary) cooperation of municipalities sharing a river catchment or certain river stretches. The basic principle is to coordinate measures of flood risk management (e.g. structural flood protection, flood retention, spatial planning, flood warning) at catchment level and not to divide the catchment into different management areas. This measure is required both by the EU Water Framework Directive and the EU Flood Directive.</p>

Intended goals of practice/measure
<p>The goal of this measure is to increase effectivity in flood risk management in general and flood-related planning in particular. Cooperation of municipalities is able to overcome the so-called “problem of fit” (i.e. administrative areas do not match the biophysical areas relevant for flood risk management) and avoid negative downstream effects caused by upstream municipalities (e.g. flood protection by dikes in the upstream part of the catchment increase flood hazards in the downstream part).</p>

Characteristics of practice/measure

The measure is suitable for any kind of river catchments but it is most likely to realize it at regional level. It requires triggers such as recent flood events and the respective risk awareness, financial and administrative support by the government, a clear hazard expertise as well as initiative and commitment of local political stakeholders.

Effectiveness in operation

The measure is very effective because it allows to analyse and consider interactions between upstream municipalities and downstream municipalities. Flood risk management projects can be coordinated and thus be more effective, e.g. by avoiding downstream negative effects by coordination. It is essential to regard the catchment as one planning unit.

On soil conservation

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On flood control

On water quality conservation

*

Costs

Related costs vary depending on the size of the catchment and the flood risk management measures included.

Investment costs

*

Operational costs

*

Economic losses of land owner/users or other

*

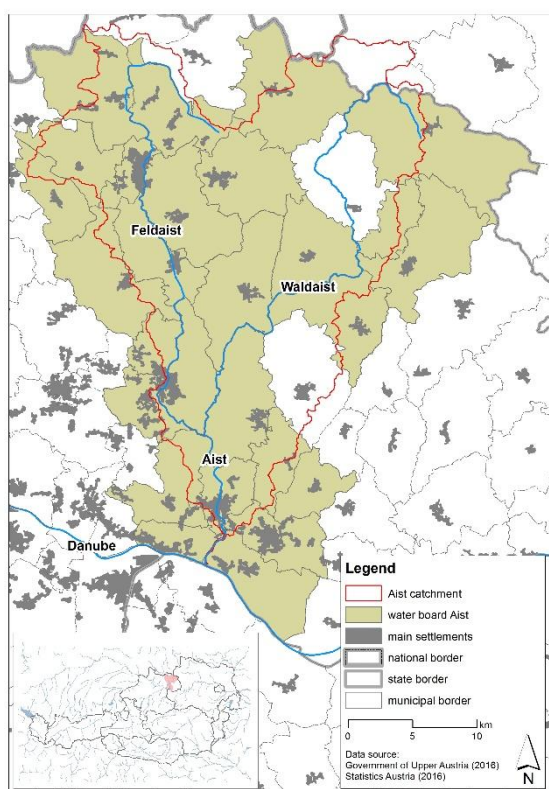
stakeholders	
---------------------	--

Potential problems/conflicts	
<p>Potential conflicts can occur as a result of aligning all stakeholders involved in the planning process. Catchment can be quite large, so many stakeholders are involved and many interests have to be met. Characteristic obstacles for cooperation are fears concerning the reduction of municipal options, time-consuming processes and problems concerning cost allocation between the cooperation partners. Currently there is no legal possibility to enforce a cooperation of municipal stakeholders.</p>	
Rate	**

Required or supported by governmental policies (legal framework, directives, financial incentives, other governmental programs etc.)?									
Required by EU directives, partly supported by state governments.									
Country	AT	BG	HR	CZ	D	HU	RO	RS	SLO
yes/no	yes			yes					

Applied in the country?									
<p>There are many water boards in individual countries, established for river maintenance but few for flood risk management (see picture below).</p>									
Country	AT	BG	HR	CZ	D	HU	RO	RS	SLO

Select level: *, **, ***	**			***					
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Catchment based approach in flood risk management: The Aist water board in Upper Austria, a cooperation of 27 municipalities (Source: IRUB)

2.5 Implementation of land-saving development measures

Type of practice/measure		
Technical	Management	Other - specify
	X	

Description of practice/measure
Implementation of land-saving development measures is a planning tool applied at local and regional level. The basic principle consists in zoning building land, commercial areas and infrastructure as land saving as possible. Upon building, soil sealing should be reduced as much as possible. Land that is already sealed and/or built upon and not used anymore should be reused or unsealed.

Intended goals of practice/measure
The intended goal of this measure is to reduce land take and to preserve unsealed land. Land is a limited resource and cannot be increased, therefore it is necessary to treat it carefully. Soil sealing also increases the rate and the velocity of surface water runoff. If soil retains its capacity to soak up water at large scale it has a considerable effect on preventing floods.

Characteristics of practice/measure
The measure is suitable for any kind of local and regional land use planning. It can be implemented in various planning instruments.

Effectiveness in operation

The measure is very effective on soil conservation. It is THE measure for soil conservation since its goal is to preserve unsealed land. There are also positive effects on flood control. Positive effects are also expected on water quality conservation since the water gets filtered by the soil which leads to better groundwater quality.

On soil conservation

On flood control

**

On water quality conservation

**

Costs

Investment and operational costs for this measure are very low since land use planning has to be done anyway. There are economic losses for land owners because less land will be converted into building land.

Investment costs

*

Operational costs

*

Economic losses of land owner/users or other stakeholders

**

Potential problems/conflicts

Potential conflicts may arise with the interests of real estate investors, construction companies and also with (local) politicians who enforce development for economic and

employment reasons.

Rate

Required or supported by governmental policies (legal framework, directives, financial incentives, other governmental programs etc.)?

There is on the one hand governmental support for land-saving development, on the other hand there are several policies that counteract this goal of land use planning.

Country	AT	BG	HR	CZ	D	HU	RO	RS	SLO
yes/no	yes			yes					

Applied in the country?

See above!

Country	AT	BG	HR	CZ	D	HU	RO	RS	SLO
Select level: *, **, ***	*			***					



Land saving development by high density low-rise buildings (Source:
<http://www.ufg.ac.at/little-village.5449.0.html>)

2.6 Awareness raising for land-saving development and flood adaptation by participatory local land use planning processes

Type of practice/measure		
Technical	Management	Other - specify
	X	

Description of practice/measure
Awareness raising for land-saving development and flood adaption by participatory local land use planning processes is a planning measure applied at the local level. Participatory planning processes are learning processes for the stakeholders involved. The basic principle of this measure consists in giving people state of the art information and in explaining why it is necessary to implement land-saving development or flood adaptation by participation in the planning process.

Intended goals of practice/measure
The intention of this measure is to raise awareness by involving people into local land use planning processes that deal with land-saving building types (e.g. high density low-rise buildings) or flood adapted building types. The overarching goal is to change peoples' behavior concerning land consumption and risk awareness.

Characteristics of practice/measure
The measure is suitable for participatory settings in local development planning processes.

Effectiveness in operation

Awareness raising may be effective on the long run. It takes time, energy and persistence. Effectiveness in that case, however, is hard to quantify.

On soil conservation

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On flood control

**

On water quality conservation

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Costs

The costs of this measure are hard to judge, they depend very much on the kind of project, awareness raising and on the participation process itself. Professional moderation of the processes causes additional costs. If the process is well moderated and people finally support the project, costs for e.g. maintenance can be saved. If a project is developed but people stop it with protests because they were not involved, costs can get a lot higher than the costs of the participatory process.

Investment costs

*

Operational costs

**

Economic losses of land owner/users or other stakeholders

*

Potential problems/conflicts

Participatory processes can have perturbing effects on the planning process which is sometimes perceived as troublesome and thus tried to be avoided. Planning without participatory process is often perceived to be easier. Awareness raising is effective in the long run and requires commitment and energy.

Rate

*

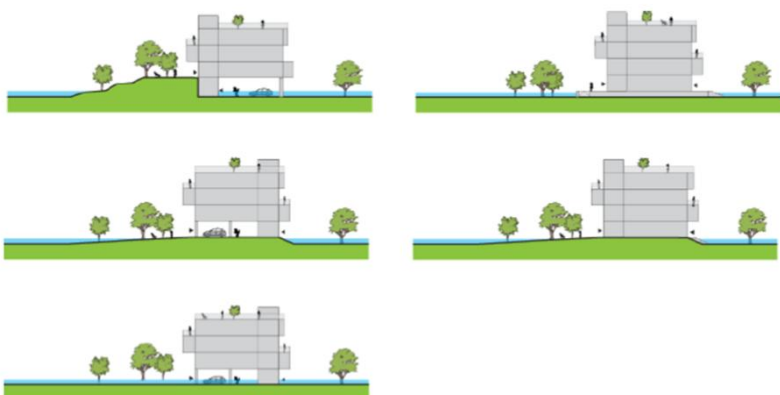
Required or supported by governmental policies (legal framework, directives, financial incentives, other governmental programs etc.)?

There are no obligations or supporting measures by governmental policies.

Country	AT	BG	HR	CZ	D	HU	RO	RS	SLO
yes/no	no			no					

Applied in the country?

Country	AT	BG	HR	CZ	D	HU	RO	RS	SLO
Select level: *, **, ***	**			*					



Flood adapted building types developed in a local land use planning process (Source: Schwaiger et al., 2015)

2.7 Land management for river restoration and flood protection

Type of practice/measure		
Technical	Management	Other - specify
	X	

Description of practice/measure
<p>Whether it comes to structural flood protection, to flood retention or to river restoration, the decisive question is about the availability of land. The implementation of those measures on mainly private land is a challenging issue because of the related impacts on property rights and property values as well as the influences on existing land use patterns. Land management according to this best management practice comprises land acquisition (property) by public purchase, land acquisition supported by land consolidation (described in 2.8), acquisition of land use rights by easements and acquisition of land use rights by contracts with land owners or by funding schemes.</p>

Intended goals of practice/measure
<p>The goal of this measure is to make land available for the public purposes of river restoration and flood protection without using the instrument of expropriation which if legally possible at all is very conflicting in implementation. Depending on the measure water management authorities would strive for public ownership on land (e.g. for retention basins or river restoration) or they would rather acquire land use rights by easements or compensate land owners by funding (agri-environmental programs) or contractual agreements (e.g. for land uses in flood plains).</p>

Characteristics of practice/measure

This measure is suitable for acquiring land or land use rights when water management authorities cannot (or do not) rely on expropriation and are ready to negotiate with land owners affected. Furthermore, it depends on a basic willingness of land owners to sell land or accept land use and property restrictions (e.g. grassland in flood plains). A property system with widespread land ownership is advantageous for implementation. Finally financial resources have to be provided by the public to buy land or to compensate land use and property restrictions.

Effectiveness in operation

Land acquisition by public purchase as well as easements are effective tools to secure public interests on land. Funding and contractual agreements are usually limited in duration and furthermore dependent on financial resources available. Providing and securing flood plains have side effects on soil conservation. Water quality conservation is not the target of this measure.

On soil conservation

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On flood control

On water quality conservation

*

Costs

Investments costs mainly depend on land prices. Operational costs can be substantial if negotiations with land owners are time consuming. Economic losses of land owners depend on land prices and on the intensity of (agricultural) land uses.

Investment costs	**
Operational costs	**
Economic losses of land owner/users or other stakeholders	**

Potential problems/conflicts	
Problems in land acquisition may arise with increasing land prices in agriculture and forestry: land is no longer affordable for river restoration and flood protection. What compensation and financial incentives have in common is the risk of becoming a 'quasi-property right' (right land owners think they can claim).	
Rate	**

Required or supported by governmental policies (legal framework, directives, financial incentives, other governmental programs etc.)?									
Land purchase is often supported by public financing. Acquiring land use rights by easement should be enforced, agri-environmental funding schemes for the cultivation of flood plains and contractual agreements should be introduced.									
Country	AT	BG	HR	CZ	D	HU	RO	RS	SLO
yes/no	yes			yes					

Applied in the country?

Land purchase by public authorities is well established (though threatened by financial restrictions), land acquisition by easements is not so common. Agri-environmental programs for the cultivation of flood plains as well as contractual agreements are lacking.

Country	AT	BG	HR	CZ	D	HU	RO	RS	SLO
Select level: *, **, ***	*			**					



River restoration in the province of Salzburg (Austria) (Source: IRUB)

2.8 Implementation of nature conservation and water management projects in land consolidation schemes

Type of practice/measure		
Technical	Management	Other - specify
X		

Description of practice/measure
<p>Land consolidation is a tool to adjust the structure of farmed holdings in order to optimize conditions for agricultural production. In land consolidation schemes landowners allow their holdings to be restructured into larger and more convenient land parcels that are more or less equivalent to the value and size of their original holdings. Land consolidation may also be used for adjusting the structure of land plots to implement non-agricultural projects, such as nature conservation and water management projects. The land required for those projects is either acquired by the authorities in charge (in that case nature conservation or water management authorities) or the farmers involved in the land consolidation scheme have to provide a certain share of their land for those measures (this possibility however is limited). Within the land consolidation procedure the land is allocated to the places where it is actually required for nature conservation and water management purposes.</p>

Intended goals of practice/measure
<p>The main goal is to support land acquisition for measures of nature conservation and water management. Given the land mobility provided by land consolidation it is not necessary for nature conservation and water management authorities (or related interest groups) to acquire the land exactly at the place where they need it.</p>

Characteristics of practice/measure

The measure (if established as a governmental instrument in the respective country) is suitable for implementing nature conservation and water management measures on agricultural and forest land (land consolidation is restricted to these land uses in most of the countries). It is required that nature conservation and water management authorities are able to buy land before or during the land consolidation procedure.

Effectiveness in operation

If the conditions mentioned above are fulfilled land consolidation is a very effective tool in allocating land for many public purposes. Besides nature conservation land consolidation is also very effective in providing land for flood protection (e.g. floodplains, retention basis, micro ponds).

On soil conservation

*

On flood control

On water quality conservation

**

Costs

For nature conservation and water management authorities the costs are mainly depending on the prices for agricultural and forest lands which vary according to the location where land consolidation is carried out. If land consolidation is a governmental procedure operational costs are low. Economic losses of land owners can be classified as low because one can assume that land owners are willing to sell the land.

Investment costs	**
Operational costs	*
Economic losses of land owner/users or other stakeholders	*

Potential problems/conflicts	
As land consolidation is a voluntary procedure it depends on the agreement of the land owners to carry out a land consolidation scheme. Especially for land consolidation in public interest, such an agreement is often insecure. High prices for agricultural and forest land is an obstacle as well.	
Rate	**

Required or supported by governmental policies (legal framework, directives, financial incentives, other governmental programs etc.)?									
Land consolidation is in number of countries a governmental instrument supported by national legislation. There is need for legal improvement in a way that land consolidation schemes can be implemented for public purposes alone without having to prove benefits for the farmers.									
Country	AT	BG	HR	CZ	D	HU	RO	RS	SLO
yes/no	yes			yes					

Applied in the country?

Land consolidation in order to implement public projects is widely used in many countries.

Country	AT	BG	HR	CZ	D	HU	RO	RS	SLO
Select level: *, **, ***	***			***					



Small Retention basin valuable for flood protection and nature conservation implemented by a land consolidation scheme in Burgenland (Austria) (Source: IRUB)