Guidelines for river channel planning for small and medium rivers

The Japanese Ministry of Land, Infrastructure, Transport and Tourism (MLIT) has published "The Technical Criteria for River Works: Practical Guide for Planning" with the editorial supervision of its River Bureau. This technical handbook presents a set of elaborate guidelines for river channel planning, which mainly focuses on channel planning for large rivers under the direct management of the central government. Although small and medium rivers are actually frequent subject to drastic modifications of river channels, specific guidelines for river channel planning have not been described for those sizes of rivers.

In the meantime, the Nature-Oriented River Works Review Committee" pointed out in FY2005 that conventional river works for small and medium rivers are still left with issues and thus need revising. The committee then issued basic guidelines for nature-oriented river works on October 13, 2005. Incidentally, in the 1997 revision, the River Law emphasized the importance of the day-by-day practice of river management. The same philosophy should also be adequately stressed in river channel planning for small and medium rivers.

This notification has been issued by the MLIT River Bureau as supplementary explanation to the Technical Criteria for River Works, compiling scores of guidelines on river channel planning for small and medium rivers, including fundamental concepts and considerations. The guidelines are crafted, taking multiple perspectives into account, such as the power and act of rivers as nature, the protection of lives and property from the occasional violent act of nature, the harmony with local livelihoods, history and culture. They also consider the conservation and creation of diverse riparian landscapes and a sound environment for creatures to live, breed and raise offspring, which is inherent to natural rivers. The guidelines presented in this notification have been issued as technical advice and should be considered as provisional until the revision of the Technical Criteria for River Works.

It is, however, possible that better ideas for nature-oriented river works may be proposed in the near future owing to social, cultural or other needs, the conditions of each project site, or progress in technology and development. In such cases, this notification will not demand that the guidelines be strictly followed. River works can be

planned and executed by complying with other ideas than ones presented here although the key concepts of the guidelines should be fully understood.

We hope that this notification will be useful in efficient, effective promotion of flood control and in assisting efforts to solve issues on river works and create a sound river environment.

1. Scope

In this notification, small and medium rivers refer to rivers under the management of local governments such as prefectures, cities, towns and villages with a basin area of less than 200 km^2 and the river importance grade of C or lower. In addition, the main focus of the notification is small and medium rivers with a relatively narrow, single cross-section. This excludes rather broad rivers with a flood plain, which should have multiple cross-sections in river channel planning, but technical advice presented in this notification should be still useful in river channel planning for low-water channels of such wide rivers.

The guidelines of river channel planning presented in this notification should be applied to river channel planning aiming to increase discharge capacity and the review of existing river channel plans: for example, to discuss river channel planning as part of river improvement plans and emergency response projects after serious disasters. Ongoing projects should also be reviewed based on this notification, if possible.

In this notification, a river bank refers to the area from the top to toe of the bank standing next to the river channel. A riparian zone (the interface between land and a river) includes the area on the land side, which is consistently affected by changes in water level, and the area on the water side, in which hydrological and environmental properties change due to the effect of plants and topography near the river. Bank protection refers to structures built to protect inland from erosion by the river stream; for example, slope protection, toe protection, crown protection, transition work, foot protection. Riparian forests refer to trees growing in the zone where trees and the river mutually affect each other; for instance, the river submerges trees, and trees provide shade over the river.

2. River channel planning

1) Design high water level

The Technical Criteria for River Works defines the design high water level for small and medium rivers, stating that for rivers with a small design scale, if the water surface slope is adequate even after taking the conditions of the downstream channel into account, the design high water level should be set at the ground level. No floods due to levee breach occur in excavated rivers, but if the design high water level is set lower than the ground level, the disaster risk may be greater in downstream river sections with levees in case of a flood exceeding the design scale. Therefore, the design high water level for a non-levee river should be set at the ground level to avoid too much stress on downstream river sections.

When planning river improvement with large-scale widening and excavation in an excavated river whose design high water level has been set lower than the ground level in the area, it is desirable to discuss the review of the design high water level as necessary for the reasons above.

Raising the design high water level may require raising the bridge clearance height at the same time. In such a case, raising the bridge clearance should be discussed according to the minister's special approval system defined in Article 73-1-4 of the Government Ordinance for Structural Standard for River Administration Facilities (Structural Standard) in consideration of the conditions of the bridge and the relationship between the bridge and the land use around it, if the river does not have a source of woody debris in its upstream area or the river is a small one with a low flood velocity. It should also be remembered in river channel planning to consider the effect of a raised design high water level on other water channels connected with the river.

When the design high water level is set at the inland ground level, the implementation of freeboard levees may be planned. Like the bridge clearance height, however, building freeboard levees requires a great deal of discussion on the river conditions, and should not be selected as a quick solution (Article 20 of the Structural Standard is only applicable to cases in which levees already exists). If the decision is made to build freeboard levees after due consideration of the conditions of the surrounding land, the levee height should be kept as low as possible pursuant to Article 20-1 of the Structural Standard.

2) Normal line and river width

When a river has undergone changes over years to have proper river bed morphology and material for the formation of a sound natural environment, in other words, when the current conditions of the water route at normal times have helped form a sound natural environment, the normal line of the river should not be altered as much as possible. On the contrary, when the river bed is not in good condition, it is important to ensure as broad a width as possible for the river bed in order to practice recommendations in the Guidelines for Nature-Oriented River Works, such as "make the best of the properties and mechanism of nature" and "use the natural resilience of rivers." These points should be kept in mind in river channel planning as part of nature-oriented river works.

In the case of large rivers under the direct management of the central government, there is often enough space for the water route to alter its course within the low-water channel. In such cases, the issue in river channel planning is the conditions of the low-water channel, and the Technical Standard for River Works describes this area of works rather elaborately. In the case of small and medium rivers, which are often under various constraints such as use of surrounding land, many of them have a narrow channel with bank protection directly limiting its normal water course. In some cases, however, river improvement projects plan to double, or more, the discharge capacity of small or medium rivers, which is a rare opportunity to restore the original nature of the rivers. If such projects select river bed excavation without thorough discussions, it is likely to increase the flow velocity and cause dramatic changes in river channel properties, consequently posing serious issues in flood control. In the meantime, research predicts prospective increase in flood discharge due to climate change. In that sense, it is worth noting that if a river is wide enough, that will help a great deal to implement flexible, effective measures when the renovation of the river channel becomes necessary in the future. In conclusion, when cross-sectional area needs to be expanded to increase discharge capacity, widening the river width should be the first choice, which will help make the best of the original resilience inherent in rivers.

In other words, widening a river width should be the first option over others in river channel planning, aiming to ensure as broad a river width as possible while taking flood discharge, river bed slope and river bed material into consideration. Under this

principle, the river width and the normal line should be determined in consideration of other social and natural constraints. This means that they should be designed to make the most of local needs and conditions such as current topography, planimetric features, as well as available land for widening the river. Having river widening as the first option is also important in terms of the maintenance and management of river channels to avoid excess river bed excavation, which, if executed, may contribute to increase in flow velocity and scouring force. Avoiding river bed excavation will help stabilize river beds and structures and further reduce the necessity of additional measures otherwise required for structural stability. It will also reduce maintenance and management to prevent river channel scouring. However, there is a possibility that maintenance and management to prevent sedimentation may increase. In order to minimize this effort, tips listed in the section of "3) Cross-section (1) River width" in this notification should be applied as necessary. Many small and medium rivers are formed by open-cut or other types of excavation in past depositional landforms and further excavation may bring about drastic change in river-bed material component (geological conditions). In this sense, too, the excavation of river beds should be the last option to take.

When widening a river, if the natural environment of river banks, such as riparian forests, is in good condition, it is important to conserve the present conditions as much as possible, for example, by widening only one side of the river banks without forests.

3) Cross-section

(1) River bed width

In this notification, the river bed width refers to the width between both ends of the river-bed cross-section.

In many small and medium rivers, bank protection directly sets the limit of their water courses at normal times. However, when planning a river cross-section in a river widening project, the river-bed width should be designed to be as wider as possible in consideration of the following points:

-Ensure enough space for phenomena essential for natural river formation such as sediment transportation and river bed fluctuation so as to form a sound natural environment, or avoid as much as possible altering the river bed that is currently providing a sound natural environment.

-Avoid taking measures that may increase the flow velocity because an increased

velocity may act on the river bed in an unfavorable way. Avoiding such measures will lead to spare additional measures that will otherwise be needed to prevent change in river-bed morphology and river-bed degradation.

In contrast, if the flow velocity to act on the river bed during flooding decreases to a large extent, for example, by flattening the river bed when widening it, sediment movement and river-bed fluctuation will halt and eventually the river will lose the power to form and maintain a natural river environment. In particular, if the river bed becomes excessively stable after river widening, the river may be entirely covered with vegetation or tree growth in the river channel may be alarmingly accelerated. Careful attention should be paid to avoid these conditions because they may result in worsening the river environment and at the same time causing problems in flood control. For these reasons, the possibility of river channel maintenance by means of river flow should be examined by looking into the relationship between river bed material and tractive force after river widening, and necessary measures, such as building a low-water channel, should be implemented if the tractive force is found not strong enough. When building a low-water channel, it is not necessary to build both a high-water channel and a low-water channel. It is important to envision a prospective channel shape that may be formed naturally through flooding over time and improve the channel accordingly.

Low slope gradients are often desirable for river banks to restore nature and ensure people's access to riparian zones, but there may be constraints in river width (i.e., land width for river widening). In such cases, however, it is also effective to secure enough space for river-bed widening to maximize the river's natural resilience by setting the slope gradient at about 1:0.5. While the slope gradient is set at this much, it is important not to narrow the river width but to ensure a sufficient river-bed width so that a sound water route will be formed with in the current river width. This is also effective as adaptation to climate change.

As an ideal cross-sectional shape for creating a natural river landscape, it is desirable to set the slope gradient at a ratio of over 1:2.0 if the river bed width three times or more the height of the cross-section can be secured.

If the slope gradient is set at over 1:2.0, it is also important not to bury the current river bed with additional embankment.

(3) River bed excavation

If widening of a river is not possible due to land constraints, minimal river bed excavation should be considered as an option. Careful discussions are needed whether to adopt this option, because river bed excavation may harm the stability of the river bed by bringing about drastic change in characteristics of river channels and river environment, including river bed material, river bed slope gradient, surrounding vegetation and landscape. Based on previous projects of widening cross-sectional area and their environmental impacts, excavation should be limited up to 60 cm deep. If excavation deeper than that limit is expected, it is absolutely necessary to review a river channel project by experts with adequate technical knowledge and experience. Such a project should also be developed in due consideration of medium- and long-term changes in river channel and the effect of excavation on water intake and structures such as bridges, which involves a variety of factors such as river bed material, river bed slope gradient, property of soil underneath the river bed, and the trends of sediment supply and river-bed fluctuation. If a case like this actually happens, it should be reported to the River Environment Division of the River Bureau of the Ministry of Land, Infrastructure, Transport and Tourism for the sake of accumulation of technical knowledge. However, if excavation exceeds 60 cm deep on average at some parts of the river channel or for removal of temporarily deposited sediment, this should not be considered a case requiring reporting. Such cases include river bed excavation needed for some sections of the river channel located upstream of areas in which a weir will be renovated or removed or excavation needed to remove sediment originating in collapse around the river channel and having deposited on the river bed.

When excavating, the cross-sectional shape of the river bed should be created by shifting the water route and the longitudinal and cross-sectional topography downward parallel to the original shape so that the river will be able to maintain the characteristics of the naturally-formed river bed right after the modification. It is important not to apply a trapezoidal shape that causes a flat river bed. The following should be kept in mind when carrying out excavation:

-Excavation should not bring about drastic changes in river bed material (or geological conditions).

- If gravels and rocks constituting the river bed are removed when widening a river or excavating the river bed, river bed degradation may result because river bed material becomes finer than before. Therefore, gravels and rocks should be kept in

the river channel in order to avoid any drastic changes in the conditions of the current river bed. Even if rocks are so large that they show above the river bed surface, they should be kept as they are if found as necessary, and the flow area should be planned in consideration of such conditions.

4) Longitudinal section

When planning a project on longitudinal sections, careful consideration is necessary to secure the stability of the river bed and the continuity of creature migration between upstream and downstream areas.

River channel projects have the following advantages when mainly aiming at more cross-sectional area and a broader width of the river bed by river widening:

-Such projects will not increase flow velocity or tractive force during flooding.

-If the current river bed is maintained by avoiding excavation and are in good condition, the river's original resilience can be maximized.

-Owing to these factors above, drastic changes in river bed that will make it difficult to maintain longitudinal sections will not be brought about easily, compared with projects with large-scale excavation.

River channel projects as such can offer many advantages for stabilizing the river bed and can be implemented while paying adequate attention to the continuity of creature migration between upstream and downstream areas. Therefore, as long as the current river-bed is in good condition, the current longitudinal section should be kept as it is. If cross-sectional structures, such as groundsill for changing longitudinal slope gradient, need to be built in the channel, they should be installed at a minimum number of places after considering river channel maintenance mainly by means of river widening.

If a river channel project using excavation to increase cross-sectional area is left as the only option because of difficulties in executing river widening, it should be carried out in consideration of the following points:

i) Shallow excavation (an average excavation of less than 60 cm deep mentioned in "2. 3) (3) River bed excavation") As described in "2. 3) (3) River bed excavation", parallel shifting of the longitudinal section should be considered first in order not to change river bed morphology and other conditions when the current conditions are favorable. However, if drastic changes in river bed material and other factors are predicted due to excavation, careful review of the project should be done as explained

in the next section right below.

ii) Deep excavation (an excavation of over 60 cm deep)　As described in "2. 3) (3) River bed excavation", the longitudinal section should be designed in consideration of possible river bed fluctuation due to excavation. Drop structures should be avoided as much as possible not to interrupt the continuity of creature migration between upstream and downstream areas. However, if they are found absolutely necessary, they should be designed and installed while paying due attention to the continuity of upstream and downstream migration of riparian creatures, landscapes, and river bed fluctuation after installation.

iii) When excavation is carried out in steep rivers, it is important to understand the relationship among river bed material, river bed morphology and river bed slope, all of which have been formed there naturally. Based on that, careful discussions should be done to maintain river bed material including large rocks in the current channel, and a project plan should be developed in the way it will maximize the role of large rocks in stabilizing the river bed. In such planning, it is desirable to positively look into ideas to produce the effect of drop structures by placing large rocks in an effective way. To do so, the stability of bank protection against river bed deformation during flooding should be examined in reference to cases of similar rivers. Moreover, even without excavation, large rocks should not be removed from the river channel in principle.

5) Roughness coefficient

In the examination of discharge capacity, roughness coefficient to be set corresponding to the designed longitudinal and cross-sectional shapes should be approximately at the same level as the current one, if the current river conditions are favorable. At least, it should not be set to be lower than the current level. In particular, if the river has a cross section that is rather narrow with bank protection, one should keep in mind that the river's roughness coefficient can be largely affected by that of bank protection. On the other hand, if a river is planned to be widen to a great extent, due attention should be paid to increase in roughness coefficient due to vegetation growth.

Roughness coefficients for small and medium rivers are often hard to determine from those calculated based on past flood marks. In such cases, they should be set in reference to those of similar rivers or the "investigation" volume of the Technical Standard for River Works.

3. Planning and design of river banks, bank protection and riparian zones

River banks and riparian zones have relatively greater impact on the river environment in small and medium rivers than in large rivers.

On the other hand, many small and medium rivers have a single cross-section channel and are often under constraints such as local land use. For these reasons, it is generally difficult to ensure enough width to tolerate bank erosion, and in many cases, solutions to this problem are installation of structures such as bank protection and groins. Thus, it is particularly important in creation of a sound river environment to make appropriate decisions on the necessity of bank protection structures and to develop reasonable plans and designs when decisions are made on the installation of such structures.

Based on this understanding, this section explains the basic concept of planning and designing river banks and riparian zones in order to initiate full-fledged promotion of nature-oriented river works from a comprehensive viewpoint of flood control and environmental conservation, i.e., bank protection described in the Cabinet Order concerning Structural Standards for River Management Facilities and the Technical Standard for River Works and the river environment (river landscape and natural environment).

Some structures are out of the scope of this notification; for example, bank protection required for the installation of levees, groundsills, weirs, water gates, sluice gates, intake towers, or bridges, and stepped structures and slopes on river banks for access to river beds and riparian zones. However, it is recommended that technical advice in the notification should be consulted for the construction of these structures that should be in harmony with surrounding landscapes.

2) Formation of natural riverbanks and riparian zones

Natural river banks are diverse in slope gradient and shape, depending on river channel properties such as discharge, river-bed slope, and river bank material. The outer side of a river bend often has a steep gradient with deep pools in riparian zones while the inner side has a gentle gradient with sandbars in the riparian zones. With

these features in mind, river banks and riparian zones should be designed in due consideration of characteristics of river channels and the natural environment, and should be built to be as natural as possible with natural diversity both longitudinally and cross-sectionally, instead of creating flat, monotonous rivers by applying the same slope gradient.

Additionally, material for river banks and beds, such as embankment and ripraps, which are available on the site, should be used to form natural riparian zones so as to ensure sediment deposit as a basis for riparian vegetation and to increase diversity in the river environment. Measures like these should be taken to encourage riparian vegetation to grow naturally and cover the boundary between the riparian zones and the river and to avoid forming geometric riparian zones that are linear and monotonous.

Vegetation in the riparian zone provides important habitats for creatures including insects, fish and birds. It is also important as routes for creatures to migrate between land and water and as a source of feed from land for fish and other creatures. Effective placement of embankment and ripraps helps create low-velocity stream zones, which are essential to provide fish and other creatures with a sound habitat environment.

3) Criteria for the installation of bank protection

Options without the installation of bank protection for erosion control should be considered first if the channel of the target river section has the characteristics listed below (i~vii). Even in the case of improvement works for river banks with bank protection, the necessity of such structures should be carefully discussed in the same manner instead of taking the installation of new bank protection for granted. In either case, only when the necessity of bank protection is justified from the viewpoints of prevention of bank erosion and scouring, the installation of bank protection and other structural measures should be discussed in consideration of "4) Design considerations for the installation of bank protection," which will be explained later.

i) The necessity of bank protection is considered to be low due to land use and other conditions of their surrounding areas.

ii) The current banks have been formed naturally and seem to have had no serious erosion from past floods, and little change is expected due to the impact of the river stream on the river banks even under the river-channel conditions after improvement works.

iii) The current banks are formed of rocks, and no drastic progress in erosion is expected.

iv) The river width widens locally, creating dead water zones.

v) Side bars have developed on the inner side of a curvy section to become high enough to cover the river bank, and even large floods are expected to cause no changes in such conditions (e.g., no events are expected in which the main stream shifts towards the inner bank and starts to erode side bars there).

vi) The representative velocity is 1.8 m/s or lower after improvement works (excluding cases in which the river banks are not covered with gravels capable of protecting the river banks while bare land is possibly left on the banks).

vii) Bank protection is needed but alternative measures such as spur dykes are considered to be better options.

4) Design considerations for the installation of bank protection

(1) Conservation of environmental functions of bank protection

The basic attitude towards the installation of bank protection is that it is an option among many used in a river maintenance project for river banks and riparian zones, and that the option should be considered only if its necessity is justified for flood control reasons. When selected, bank protection should be built to ensure adequate flood control safety and to secure crucial functions to mitigate flood impact on a prospective river environment after the project. In other words, in planning bank protection, it is important to have a view point of securing environmental functions that are inherent to river banks and riparian zones, as described in section 3.1, in addition to ensuring flood control functions.

In planning bank protection, the following environmental considerations should be taken into account:

i. Bank protection should have vegetation on its top of slope and riparian zones. The visible part of bank protection should be minimized. These requirements may not be applied to cases in which bank protection itself is also being part of the nature-oriented river landscape on the site.

ii. Bank protection should be designed to provide a sound environment for creatures needing riparian zones and hinterlands to live, nurture offspring and migrate between land and water, as well as to be in harmony with surrounding landscapes.

a) Bank protection should be in harmony with surrounding landscapes in the

following points:

-Materials used for bank protection should have brightness, colorfulness and texture in harmony with surrounding landscapes.

-Boundaries formed by bank protection at its top and bottom with the bank crest and the river, respectively, should be inconspicuous in harmony with surround landscapes.

b) Bank protection should be designed to provide a sound environment for creatures to live, nurture offspring and migrate between land and water.

-Bank protection should be designed to provide spaces that can turn into habitats of creatures and plants. However, care should be taken to avoid creating landscapes that are not natural by prioritizing making spaces too much.

-Bank protection should be designed to have appropriate permeability and water retention capacity to ensure the slope containing proper water content for habitats of creatures.

(2) Conservation of the environmental functions of riparian zones in relation to bank and foot protection

The installation of bank and foot protection easily ruins the natural qualities of riparian zones. Extra precaution should be taken by mobilizing measures to form natural river banks and riparian zones described in section 3-2.

Foot protection in the riparian zones should be installed in the way that its crest stays under the water surface by investigating changes in river water level beforehand. Ripraps and other measures should be applied instead of foot protection so that it can remain part of the landscape on the site even if it emerges above the water surface. However, these considerations may not be taken into account if the exposure of foot protection is not considered to be problematic in terms of historical and cultural landscapes or river use including ship transportation.

If a deep pool exists at the water colliding front, it should be conserved for the roles it has in the river environment (as a space for fish to rest, evacuate during flooding, stay during winter, etc.). To protect a deep pool, the crest height of the embedment and the construction area and height of foot protection should be determined based on assessment results on the locations, area and deepest river-bed height of the scouring

zone.

(3) Use of the top of the bank protection along an excavated river

A narrow strip of space ("doha" in Japanese) created in the top of the bank protection along an excavated river in an urban area is often very important environmentally, providing a place for trees to grow. In the construction of an excavated river, extra care should be taken to create such space. Even if some measures need to be applied to the bank crest for its protection, as much effort as possible should be made to create such space in the top of the slope by applying nature-oriented ideas to the structure and height of the bank protection, such as covering the bank crest with earth to improve the river environment.

In planning the construction of bank protection, due consideration should be given to mitigation of CO_2 emissions to prevent global warming, for example, by selecting a construction method that uses locally-available materials.

4) Use of riparian forests

If riparian forests exist in the current river channel, it is desirable to conserve them after thorough reviews on issues such as flood safety, plant management, and woody debris control. Riparian forests contribute to forming a sound river environment by providing shades that are comforting and useful to keep the ground from drying. They can also serve as a feed source for creatures in the river. In addition, as Article 15-2 of the Guidelines for Tree Planning and Cutting in River Channels (the notification issued by the division director of the River Improvement and Management, River Bureau, Ministry of Construction on June 19, 1998) states, it is possible to plant trees in parts of the river channel such as dead water zones in wider river sections. Thus, nature-oriented structures including tree planting should be thoroughly considered from viewpoints of river landscapes and the natural environment. It is also recommendable to secure an adequate width for the river when planning urban development so that extra space for planting trees may be created in the river channel.

When planning river protection adjacent to trees, due consideration should be given to its structure that should help conserve trees and have sufficient strength to withstand the growth of tree roots.

4. Additional structures

1) Maintenance roads

In the case of an excavated river, the necessity of maintenance roads and their width need to be reviewed in consideration of the overall river width. Item 7-(2) of the Application of the Cabinet Order Concerning Structural Standards for River Management Facilities and its Enforcement Regulations, issued as the notification by the division director of the River Improvement and Management, River Bureau, Ministry of Construction in 1977, defines issues on maintenance roads for levees with a low height from the ground level. Based on the 1977 notification, the necessity of maintenance roads and their width should be studied adequately in addition to its necessity in terms of flood control. In the case of provisional improvement work, the construction of maintenance roads should be discussed in consideration of cost and environmental constraints and the possibility of rework in the future.

In the case of urban rivers, however, maintenance roads are often needed with an enough width to help create a sound riparian environment in relation to urban development. In such cases, the construction of maintenance roads should be reviewed in consideration of other existing adjacent roads by taking the relationship between rivers and urban development into account.

2) Access to river beds

When access to river beds and riparian zones is extremely limited, for example, when bank protection with a 1:0.5 slope is applied to the river banks, stairs and slopes should be built at proper intervals to ensure better access to riparian zones by taking necessary care so that the construction will not interfere channel maintenance and management and other activities in riparian zones.

5. Considerations for maintenance and management

A sound riparian environment that is designed in river channel planning should not be created artificially for a short period of time. Instead, it should be created through

improvement based on regular observations and follow-up investigations after river maintenance and other projects in consideration of changes of river channels due to flooding and other events. Regular maintenance and management of river channels including the natural environment are also important to create such a riparian environment. In other words, the river environment should be improved by managing the river channel in an adaptive manner. Furthermore, collaboration with local residents and community groups are necessary to make such efforts for a long time in a widespread area and to address issues on the river environment continuously.

6. Supplementary provision

1) The technical guidelines for river channel planning concerning small and medium rivers, enacted on March 31, 2008, are terminated.

2) This guidelines are put into force on August 9, 2010.

Note:

The following is information on this notification.

Date of issuance: August 9, 2010

Title: On technical guidelines for river channel planning for small and medium rivers

From: Heads of the River Environment Division, the River Improvement and Management Division, and the Disaster Prevention and Relief Division

To: Heads of the river departments of MLIT regional bureaus and heads of the civil engineering departments of municipal governments

国河環第３０号
国河域第７号
国河防第１７４号
平成２２年８月９日

地方整備局等河川部長　殿
都道府県・政令指定都市土木主幹部長　殿

国土交通省河川局　河川環境課長
治水課長
防災課長

中小河川に関する河道計画の技術基準について

This English translation of the notification has been prepared by ICHARM in December 2014. This is an unofficial translation and thus is to be used solely as reference material to aid in the understanding of the notification.