LAWA

German Working Group on Water Issues of the Federal States and the Federal Government

Annex 4 to the recommendations on establishing, reviewing and updating flood risk management plans

LAWA methodology for assessing progress towards the achievement of objectives

Adopted at the 158th LAWA General Assembly

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LAWA Standing Committee on Flood Protection and Hydrology (LAWA-AH)

German Working Group on Water Issues of the Federal States and the Federal Government (LAWA)

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List of abbreviations

Para.	Paragraph
APSFR	Area of Potentially Significant Flood Risk (= risk area)
Art.	Article
AwSV	Ordinance on Facilities for Handling Substances that are Hazardous to Water
BfG	Federal Institute of Hydrology
BGBl	Federal Law Gazette
BLANO	Federal/Länder Committee of the North Sea and the Baltic Sea
CIS	Common Implementation Strategy for the Water Framework Directive
COM	Completed
EEA	European Environment Agency
EC	European Community
EG HIRI	Expert Group on “Flood Risks”
EC FRMD	Directive 2007/60/EC of the European Parliament and of the Council of 23 October 2007 on the assessment and management of flood risks (Flood Risk Management Directive)
EC MSFD	Directive 2008/56/EC of the European Parliament and of the Council establishing a framework for Community action in the field of marine environmental policy (Marine Strategy Framework Directive)
EC WFD	Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy (Water Framework Directive)
EU	European Union
EU COM	European Commission
RBC	River Basin Community
FloRiAn	Flood Risk Analysis Tool (ICPR tool for verifying a reduction in the flood risk)
GAK	Joint Task for the Improvement of Agricultural Structures and Coastal Protection
FH map	Flood hazard map
FR map	Flood risk map
FRM	Flood risk management
ICPR (IKSR)	International Commission for the Protection of the Rhine
IED	Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (Industrial Emissions Directive) (integrated pollution prevention and control)
IED installations	Installations as defined in the EC Industrial Emissions Directive 2010/75/EU on Integrated Pollution Prevention and Control
INSPIRE	Infrastructure for Spatial Information in the European Community
SG-FRM	Sub-Group on Flood Risk Management
LAWA	German Working Group on Water Issues of the Federal States and the Federal Government
LAWA-AH	LAWA Standing Committee on Flood Protection and Hydrology
LAWA-GA	LAWA General Assembly
MSFD	European Marine Strategy Framework Directive 2008/56/EC
NS	Not started

OGC	On-going construction (one-off, such as building work)
OGM	On-going maintenance (continuous, recurring / permanent, such as watercourse maintenance)
IP	In preparation (in preparation, e.g. planning)
Directive 2000/60/EC	*See EC WFD*
Directive 2010/75/EEC	*See IED*
ROG	Spatial Planning Act
SCG	Strategic Coordination Group
SuDS	Sustainable Drainage Systems
SEA	Strategic Environmental Assessment
FZ	Flood zones
UVPG	Act on the Assessment of Environmental Impacts
WasserBLIcK	BfG portal on behalf of LAWA for Germany's electronic reporting to the EU
WHG	German Federal Water Act
WISE	Water Information System for Europe
XML	Extensible Markup Language (meta standard for file formats)

1 Preamble

The implementation of FRM measures is scrutinised carefully when assessing progress towards the achievement of objectives. To this end, we compare the implementation status for the two reporting dates for FRM plans:

- Reporting date for the first cycle: 2015
- Reporting date for the second cycle: 2021

Since the submission of FRM plans is preceded by extensive participation under the Strategic Environmental Assessment and in other areas, the data status may actually refer back to 2020.

The reporting dates cover 6-year periods (cycles):

- First cycle: 2009 to 2015
- Second cycle: 2015 to 2021
- Third cycle: 2021 to 2027

Each FRM plan relates to the subsequent 6-year period (currently 2021 to 2027), and progress is assessed retrospectively for the preceding 6-year period (currently for 2015 2021).

2 Introduction

2.1 Task

Annex B of the EC FRMD requires Member States to assess and document the progress of risk management towards achieving objectives as part of a cyclical review and update. In the course of updating the LAWA recommendations on "Establishing, reviewing and updating flood risk management plans", the sub-group created for this purpose has devised a common methodology, details of which can be found in this Annex.

Initial research into existing methods/approaches in Germany (including the EG HIRI tool "IKSR FloRiAn (Flood Risk Analysis)" (IKSR 2016) and the methods outlined in the WFD and the MSFD) and in other European countries (including AT, CZ, GB, IE, etc.) revealed that the FloRiAn tool is not (yet) suitable for nationwide use. No other European country has a fully formulated approach yet either. A survey of all federal states and RBCs on concepts and preparatory work in this field confirmed this.

The LAWA-AH workshop on "Damage potential" revealed ongoing divergence between the attitudes, principles and approaches of individual Länder to the assessment of damage potential. A number of commissioned studies will need to be completed before developing a standardised nationwide methodology for analysing damage potential.

An EU-COM report on Germany's FRM plans for the first cycle ("First Flood Risk Management Plans - Member State: Germany", Brussels, 26.02.2019) is now available. One weakness identified by the EU in Germany's plans from the first cycle is that "The objectives in Germany are not measurable (no timeframe, no indicators ..."). This poses a number of questions, including the issue of how best to measure and evaluate progress towards the achievement of objectives from the second cycle onwards.

2.2 Approach

Our work to develop a methodology for assessing the achievement of objectives comprised the following:

- The objectives/systems of objectives and catalogues of measures from the 1st cycle plans for the Elbe, Oder and Weser RBCs as well as Länder with other river basins (including Baden-Württemberg, Bavaria, Hesse, North Rhine-Westphalia) were evaluated.
- The objectives of the 2013 LAWA recommendations on the establishment of FRM plans (four overarching objectives and "possible objectives" from the descriptions of measures in Annex 3) and the systems of objectives in the FRM plans from the first cycle were combined into one harmonised system.

- Criteria were identified for the individual objectives which could be used to measure progress towards the achievement of each objective.
- Suitable indicators (LAWA measures) were determined for each of these criteria. Below, we explain how these indicators affect achievement of the respective objective (chain of effects) and their contribution towards the overarching objectives (impact).
- Ranked valuation principles are applied to each indicator, creating categories of progress towards the achievement of objectives.
- Progress is documented using text modules, depending on the outcome of the calculations.

The methodology may reveal that certain Länder have farther-reaching requirements with regard to documenting and updating FRM measures.

3 The LAWA system of objectives

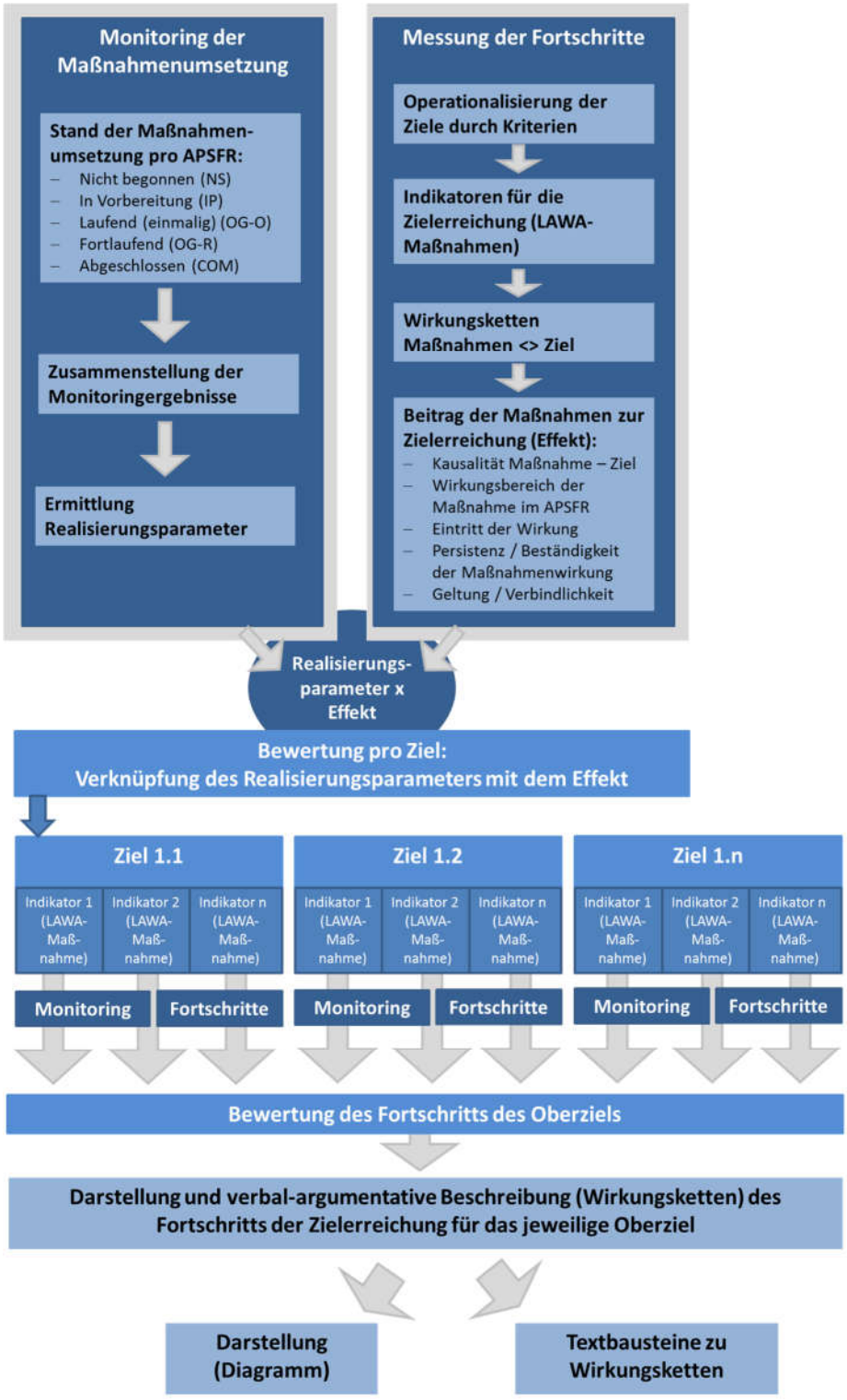
The LAWA recommendations on establishing, reviewing and updating FRM plans contain a list of suitable objectives based on an agreed nationwide flood risk management structure and identify appropriate measures for achieving them. In Germany, the following overarching FRM objectives have been defined:

- Prevent new risks (before a flood) in the risk area,
- Reduce existing risks (before a flood) in the risk area,
- Reduce adverse consequences during a flood,
- Reduce adverse consequences after a flood.

These overarching objectives are designed to prevent and minimise the adverse impacts of flooding on all four protected assets (human health, the environment, cultural heritage and economic activity). They also incorporate the four EU principles (prevention, protection, precaution and restoration/regeneration). This system of objectives, including detailed definitions of the four overarching objectives, can be found in Chapter 2.1.2 of the Recommendations on Establishing, Reviewing and Updating Flood Risk Management Plans.

4 Assessing progress towards the achievement of objectives

Figure 1 provides a general overview of the methodology. The individual steps are described below.



<Legende>:

Monitor the implementation of measures

Implementation status of measures for each APSFR:

NS (Not started)

IP (in preparation)

OG-C (on-going – one-off)

OG-M (on-going – recurrent)

COM (completed)

List monitoring results

Identify implementation parameters

Measure progress

Operationalise the objectives with criteria

Indicators of objective achievement (LAWA measures)

Chain of effects

Measures <> Objective

Contribution of each measure towards achieving the objective (impact):

- Causality between measure – objective
- Effectiveness range of the measure in the APSFR
- Onset of effect
- Persistence / durability of the measure's effect
- Validity / binding nature

Implementation parameter x impact

Assessment per objective: Linking the implementation parameter to the impact

Objective 1.1

Indicator 1 (LAWA measure)

Indicator 2 (LAWA measure)

…

Objective 1.2

Indicator 1

…

Objective 1.n

Indicator 1 …

Monitoring

Progress

Monitoring

…

Assess progress made towards the overarching objective

Present and verbally describe (chain of effects) the progress made towards the overarching objective

Presentation (chart)

Text modules for chains of effects

Figure 1: Overview of the methodology used to assess the achievement of objectives

4.1 Tools and practical implementation

Analysts in the individual Länder, working at APSFR level, carry out an assessment (determine the implementation parameter, assign the impact, calculate the contribution to progress and evaluate on a five-point scale).

The results (assignment and selection of text modules) are documented for each river basin or agreed processing level within the river basin. The Länder deliver the results of all relevant APSFRs within a given river basin to the respective River Basin District. They in turn prepare a summary for each overarching objective which is then incorporated into the FRM plan.

An Excel tool for assessing the overarching objectives and a second Excel tool for the 500 measures are available to assist with evaluation. These tools contain a user guide and produce tables, charts and text modules. The files including user guide are available for downloading at WasserBLIcK at the following address:

https://www.wasserblick.net/servlet/is/185137/

4.2 Assessment methodology – procedure and application

The underlying concept is that the objectives derived from the LAWA-BLANO catalogue of measures will help to achieve the overarching objectives and are measurable. Criteria and indicators are used to operationalise the objectives, with the LAWA measures being used as indicators. The objectives may be achieved by implementing the measures outlined in the country-specific catalogues of measures in the first FRM cycle.

This creates a twin-pronged approach for assessing progress:

1. Monitor the implementation of measures to gauge progress made towards achieving the objectives (implementation parameter).

2. Assess how individual LAWA measures work in relation to the objectives in order to classify their contribution to achievement of the objectives (impact).

A progress assessment is derived from these two parameters (implementation parameter multiplied by impact). The outcome is summarised in the form of verbal arguments for the overarching objective.

Implementation parameters

Based on the LAWA-BLANO catalogue of measures, each federal state documents the relevant measures for each individual APSFR. The implementation status of these measures is recorded for reporting purposes. The first cycle distinguished between the following statuses:

Table 1: Implementation status of measures in the 1st cycle (LAWA terms and definitions as well as EU terminology)

FRM plan DE (LAWA)	Explanation	EU terminology (1st cycle)
Not started	Measure has not yet started (neither planning nor construction), but is earmarked for the current cycle (within six years of drafting the FRM plan)	Not started (NS)
Ongoing (one-off, e.g. construction work, training)	Implementation of measures has begun: Construction work or planning/conceptual implementation, studies, training, etc. are in progress	On-going (OG) or on-going construction (OG-C)
Continuous (recurrent / permanent, e.g. maintenance work or watercourse maintenance)	Permanent task or regularly recurring task	On-going (OG) or on-going recurrent e.g. maintenance works (OG-M)
Completed	Measure implemented / completed	Completed (COM)
Unknown	Status of the measure is not known	Unknown (U)

The following amendments apply to the second cycle:

- The status "unknown" can no longer be used; by the second cycle, the extent of implementation progress should be known for each measure.
- A new status "in preparation POG" will be introduced, enabling a finer distinction for measures that are not yet being implemented but for whose implementation preparations are underway.

This produces the following implementation stages for the second cycle:

Table 2: Implementation status of measures in the 2nd cycle (LAWA terms and definitions as well as EU terminology)

FRM plan DE (LAWA)	**Explanation**	**EU terminology (second cycle)**
Not started	Measure has not yet started (neither planning nor construction), but is earmarked for the current cycle (within six years of drafting the FRM plan)	Not started (NS)
In preparation (e.g. planning)	Implementation is currently under preparation: The planning of measures has begun, but actual implementation (structural, conceptual) is not yet underway	In preparation (POG)
Ongoing (one-off, e.g. construction work, training)	Implementation of measures has begun: Construction work or planning/conceptual implementation, studies, training, etc. are in progress	On-going construction (OGC)
Continuous (recurrent / permanent, e.g. maintenance work or watercourse maintenance)	Permanent task or regularly recurring task	On-going maintenance (OGM)
Completed	Measure implemented / completed	Completed (COM)

The two stages "ongoing (recurrent/permanent)" and "completed" each refer to measures that have been implemented in full.

To evaluate development of the implementation status between the 1st and 2nd cycles, the status reported in the 1st cycle is always compared with the updated status in the 2nd cycle. The status "POG" can also be applied retrospectively to measures in the 1st cycle if deemed appropriate, whereby the status of "not started" or "ongoing" from the 1st cycle may be defined as "in preparation".

Table 3: Comparing the implementation status of measures in the 1st and 2nd cycle (LAWA terms and definitions as well as EU terminology)

Status in the 1st cycle	**Status in the 2nd cycle**
NS (not started)	NS (not started)
OG (ongoing) or NS (not started)	POG (in preparation)
OG (ongoing) or OG-C (ongoing construction)	OGC (ongoing one-off e.g. construction)
OG (ongoing) or OG-M (ongoing maintenance)	OGM (ongoing recurrent e.g. maintenance works)
COM (completed)	COM (completed)
U (unknown)	-/-

The implementation parameter is determined for each LAWA measure in each APSFR:

- For each individual measure in a given APSFR, we document the status for the 1st cycle and on the reporting date for the 2nd cycle. With the columns correctly arranged, all measures can then be copied directly from the database/list of measures into the Excel tool in a single operation (see Figure 2).

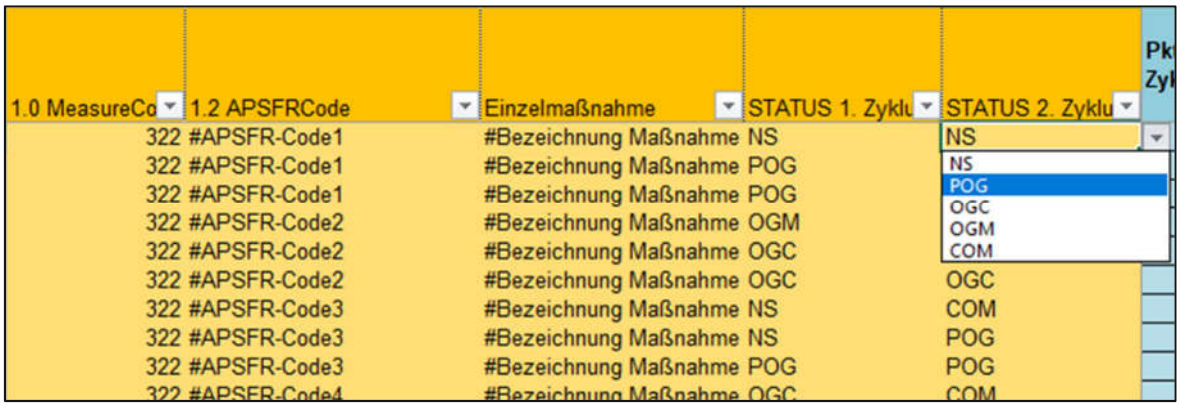


Figure 2: Input mask for recording changes in the reported status for the 1st and 2nd cycles in order to calculate the implementation parameter (fictitious example)

- Each status message is assigned points:
  - NS 0 (unknown from 1st cycle please enter as NS)
  - POG 1
  - OGC 2
  - OGM 3 (one-time / recurring)
  - COM 3

- Measures completed in the previous cycle (COM) are no longer included in the evaluation. Therefore, any measures with the status "COM" in the 1st cycle (2010-2015) will not be listed. If an entry is made with the status “COM” for the 1st cycle, an error message will appear.

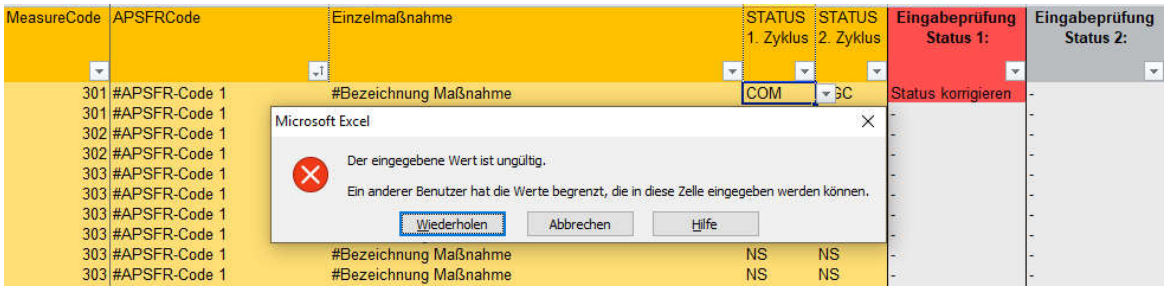


Figure 3: Warning message for an invalid “COM” status message in the 1st cycle. In addition to the warning message, the check box turns red .

- If the status “OG” was used in the 1st cycle, this may be entered accordingly in the Excel tool. This status is then evaluated depending on the entry for the 2nd cycle. If this is followed by “OGM” in the 2nd cycle, the OG is evaluated as OGM. In all other cases, “OG” from the 1st cycle is evaluated as “OGC”.

- Permanent tasks that continue from one cycle to the next (OGM) are awarded 3 points in each cycle, as they regularly contribute to further progress towards achieving the objectives.

- New measures added in the processing period 2015 to 2021 may already be making an important contribution towards achieving the objectives. For this reason, "new" measures are included in the overall list. **The status on the 1st cycle reporting date is left blank** (value 0 points), and the current status inserted for the 2nd cycle reporting date.

- The Excel tool automatically calculates the difference in points for each individual measure (see Figure).

1.0 MeasureCo	1.2 APSFRCode	Einzelmaßnahme	STATUS 1. Zyklu	STATUS 2. Zyklu	Pkt. 1. Zyklus	Pkt. 2. Zyklus	Bonus für fortlaufende Maßn. (OG-M)	Differenz (negative Werte nicht zulässig: = 0)
322	#APSFR-Code1	#Bezeichnung Maßnahme	NS	NS	0	0	0	0
322	#APSFR-Code1	#Bezeichnung Maßnahme	POG	OGC	1	2	0	1
322	#APSFR-Code1	#Bezeichnung Maßnahme	POG	COM	1	3	0	2
322	#APSFR-Code2	#Bezeichnung Maßnahme	OGM	OGM	3	3	3	3
322	#APSFR-Code2	#Bezeichnung Maßnahme	OGC	COM	2	3	0	1
322	#APSFR-Code2	#Bezeichnung Maßnahme	OGC	OGC	2	2	0	0
322	#APSFR-Code3	#Bezeichnung Maßnahme	NS	COM	0	3	0	3
322	#APSFR-Code3	#Bezeichnung Maßnahme	NS	POG	0	1	0	1
322	#APSFR-Code3	#Bezeichnung Maßnahme	POG	POG	1	1	0	0
322	#APSFR-Code4	#Bezeichnung Maßnahme	OGC	COM	2	3	0	1

Figure 4: Automatic calculation of the points difference in the implementation status of each individual measure (fictitious example)

- For each LAWA measure (summary of all individual measures in one LAWA measure) and APSFR, the sum total of points is recorded and divided by the number of individual measures. This produces the average implementation status (implementation parameter) of each LAWA measure and APSFR (see Figure 5).

APSFR_ID	APSFR Code	Measure Code	APSFR_MN	Summe pro LAWA-Maßn.	Anzahl Zeilen pro LAWA-Maßn.	Durchschn. Umsetzungsstand im APSFR
1	#APSFR-Code 1	302	#APSFR-Code 1_302	6	2	3,00
1	#APSFR-Code 1	303	#APSFR-Code 1_303	150	83	1,81
1	#APSFR-Code 1	304	#APSFR-Code 1_304	60	55	1,09
1	#APSFR-Code 1	305	#APSFR-Code 1_305	0	0	0,00
1	#APSFR-Code 1	306	#APSFR-Code 1_306	15	5	3,00
1	#APSFR-Code 1	307	#APSFR-Code 1_307	519	222	2,34
1	#APSFR-Code 1	308	#APSFR-Code 1_308	568	192	2,96
1	#APSFR-Code 1	310	#APSFR-Code 1_310	113	78	1,45
1	#APSFR-Code 1	311	#APSFR-Code 1_311	53	56	0,95
1	#APSFR-Code 1	312	#APSFR-Code 1_312	52	29	1,79
1	#APSFR-Code 1	313	#APSFR-Code 1_313	52	29	1,79
1	#APSFR-Code 1	314	#APSFR-Code 1_314	26	43	0,60
1	#APSFR-Code 1	315	#APSFR-Code 1_315	21	14	1,50
1	#APSFR-Code 1	316	#APSFR-Code 1_316	36	15	2,40
1	#APSFR-Code 1	317	#APSFR-Code 1_317	12	11	1,09
1	#APSFR-Code 1	318	#APSFR-Code 1_318	31	12	2,58
1	#APSFR-Code 1	319	#APSFR-Code 1_319	123	41	3,00
1	#APSFR-Code 1	320	#APSFR-Code 1_320	129	43	3,00
1	#APSFR-Code 1	321	#APSFR-Code 1_321	0	0	0,00
1	#APSFR-Code 1	322	#APSFR-Code 1_322	12	4	3,00
1	#APSFR-Code 1	323	#APSFR-Code 1_323	97	59	1,64
1	#APSFR-Code 1	324	#APSFR-Code 1_324	436	204	2,14
1	#APSFR-Code 1	325	#APSFR-Code 1_325	126	42	3,00
1	#APSFR-Code 1	326	#APSFR-Code 1_326	321	139	2,31
1	#APSFR-Code 1	327	#APSFR-Code 1_327	274	118	2,32
1	#APSFR-Code 1	328	#APSFR-Code 1_328	0	0	0,00

<Legende>:

Sum total per LAWA meas.

No. of lines per LAWA meas.

Ave. implementation status in the APSFR

Figure 5: Automatic calculation of the average implementation status (implementation parameter) of each APSFR (fictitious example) – this worksheet is greyed out in the Excel tool

<Legende>:

Objective 3.1

Objective 3.2

…

Overarching objective 3

Moderate progress

Not relevant

Moderate progress

…

No or very minimal progress

Moderate progress

…

Minimal progress

- Figure If individual objectives are not relevant to a particular APSFR, i.e. there are no measures (= indicators) for this objective in the APSFR as a whole, the Excel tool automatically classifies the objective as "not relevant" (see Figure 6). Non-relevant objectives have no influence when evaluating progress towards a given overarching objective.

APSFR_ID	1.2 APSFR Code	Ziel 3.1	Ziel 3.2	Ziel 3.3	Oberziel 3	Ziel 3.1	Ziel 3.2	Ziel 3.3	Oberziel 3
1	#APSFR-Code1	6,89	0,00	6,00	6,59	mittlere Fortschritte	nicht relevant	mittlere Fortschritte	mittlere Fortschritte
2	#APSFR-Code2	5,53	7,00	2,00	5,01	mittlere Fortschritte	mittlere Fortschritte	keine bzw. sehr geringe Fortschritte	mittlere Fortschritte
3	#APSFR-Code3	5,09	4,80	3,00	4,49	mittlere Fortschritte	mittlere Fortschritte	geringe Fortschritte	geringe Fortschritte

<Legende>:

Objective 3.1

Objective 3.2

…

Overarching objective 3

Moderate progress

Not relevant

Moderate progress

…

No or very minimal progress

Moderate progress

…

Minimal progress

Figure 6: If there are no measures (=indicators) for a given objective in the APSFR, it is identified and classed as "not relevant" (fictitious example)

If the evaluation of an objective is comprised of multiple LAWA measures, a factor is formed in the evaluation corresponding to the number of LAWA measures. If individual LAWA measures in a given APSFR are not relevant and are to be excluded from the evaluation for that objective, this may be entered in so-called “expert columns” (see Figure 7).

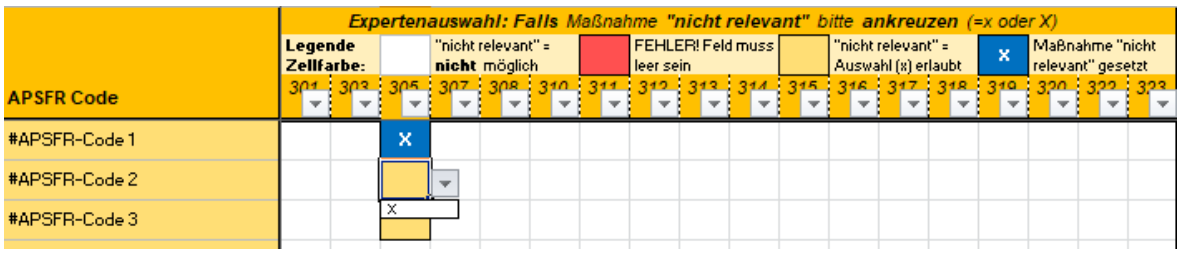


Figure 7: Controlling the calculation for sub-objectives with non-relevant LAWA measures via “Expert columns”

Effectiveness and impacts

The measures listed in the LAWA-BLANO catalogue of measures are the means of achieving the objectives. Depending on the progress made in implementing the measures (see chapter 7.3, Approaches to success monitoring), progress is also made towards achieving the objectives, the extent of which may vary.

The measures are implemented by different stakeholders at different spatial levels. The contribution made by each measure towards achieving the objectives (impact) varies and is incorporated as a weighting when determining the progress made (see Approaches to success monitoring, chapter 7.3). Points (4, 2 or 1) are awarded depending on the impact’s classification (high, moderate and low).

The classification of impacts is very dependent on generalisations and assumptions. Each individual measure may have a greater or lesser impact. Nevertheless, this general classification of theoretical effectiveness is useful when weighting the contributions of individual measures. The impact is classified by assessing the following questions:

- Does the LAWA measure have a direct or indirect impact on the achievement of objectives?

  Measures for informing the general public are a typical example of indirect impacts. The sharing of information does not in itself produce a direct 1:1 impact (improving flood preparations). This assessment also considers the impact in relation to the overarching objective – in other words, it includes the entire chain of effects of the indicator/criterion on the objective and of the objective on the overarching objective. Most indicators tend to directly impact the objective in question, but there are a few cases where the objective itself contributes only

indirectly to achievement of the overarching objective. In such cases, the overall impact is classified as "indirect".

- Are the effects of the LAWA measure area-wide or confined to individual properties or sub-regions?

  Regional planning principles and objectives have an area-wide effect, provided they are implemented by all regional planning authorities. The effects of property protection measures are limited to individual properties.

- Does the LAWA measure take effect immediately once implementation is complete, or is there a time lag?

  A measure such as relocating substances hazardous to water to a higher storey which is safe from flooding takes effect immediately, whereas flood-minimising management measures, for example, only take effect with a time lag.

- Is the effect of the LAWA measure permanent once implemented, or does it require regular repetition, or does it have a one-off effect and then become ineffective?

  As an example, the emergency services are typically required to practice regular drills dealing with different flood scenarios so that they can respond efficiently and effectively in an emergency. By contrast, an alluvial area that has undergone renaturation will retain its capacity for water retention and the effects are therefore permanent.

- Is the LAWA measure legally binding, i.e. is there pressure for it to be implemented and perpetuated, is it anchored in concepts and therefore self-regulating, or is implementation voluntary and entirely dependent on the motivation of individual stakeholders?

  For example, rainwater management concepts implemented voluntarily at municipality level may become binding within that municipality. By contrast, requirements such as human settlement restrictions in flood zones are legally binding and mandatory for all stakeholders. On the other hand, the implementation of precautions is entirely reliant on individual motivation.

Table 4: Criteria for classifying the effects of LAWA measures

Impact / Criteria	high (4 points)	moderate (2 points)	low (1 point)
Causality between measure - objective	direct	indirect	
Effectiveness range of the measure in the APSFR	area-wide	selected sub-regions	individual areas / properties*
Onset of effect	immediate	with a time lag	
Persistence/continuity of the measure's effect	permanent	regular implementation required	one-off
Validity/binding force	legally binding	anchored in concepts	non-binding, voluntary implementation

*Where a measure only acts on a specific area or property, the impact on the APSFR as a whole will be relatively small. Consequently, this LAWA is rated as having a moderate impact at best.

Chapter 5 contains a more in-depth table of criteria for classifying the impacts of each indicator (=LAWA measure) together with the results. The classification for each criterion has a grey background, while the overall result has a dark blue background in the header (see Figure 48).

Impact / Criteria	high (4 points)	moderate (2 points)	low (1 point)
Causality between measure - objective	direct	indirect	-
Effectiveness range of the measure in the APSFR	area-wide	selected sub-regions	individual areas / properties*
Onset of effect	immediate	with a time lag	-
Persistence/continuity of the measure's effect	permanent	regular implementation necessary	one-off
Validity/binding force	legally binding	anchored in concepts	non-binding, voluntary implementation

Figure 4: Background colours of results indicate the classification of impacts within the spreadsheet

The assessment of each indicator per objective is weighted according to the impacts of LAWA measures. If all LAWA measures assigned to a given objective have the same impact classification, they each contribute with equal weighting towards achievement of the objective.

The criteria for measuring progress towards the achievement of objectives, the corresponding indicators and their impacts are documented below for each objective. A detailed individual assessment can be found in chapter. 5

Table 5: Objectives, criteria, indicators and their impacts on the achievement of objectives

Obj. no.	Objective	Criteria for achieving the objective	Indicators	Impact	
1	**Prevent new risks (before a flood) in the flood risk area**				
1.1	Improve land precautions by incorporating flood risks into spatial and sectoral planning	Develop land protected by planning (land precautions)	301	High	4
		Give greater consideration to specialist water management information when preparing, amending and updating zoning plans	303	High	4
1.2	Protect land to prevent new risks and conserve water retention within spatial planning	Develop the protection of retention areas including restrictions on use	302	High	4
1.3	Increase the ratio of flood-adapted (land) use	Increase flood-adapted (land) uses	304	Moderate	2
1.4	Improve building precautions for new buildings and renovations (flood-adapted construction methods)	Consider flood prevention more extensively when selecting sites and granting building permission	306	Moderate	2
1.5	Improve flood-adapted handling (storage, processing) of substances hazardous to water	Give greater consideration to flood prevention in IED installations, Seveso III establishments and AwSV facilities	308	Moderate	2
2	**Reduce existing risks (before a flood) in the risk area**				
Obj. no.	**Objective**	**Criteria for achieving the objective**	**Indicators**	**Impact**	
2.1	Improve/increase natural water retention	Increase the amount of agricultural land with flood control measures	310	Moderate	2
		Progressively renature/reactivate water bodies, alluvial areas and former wetlands	311	Moderate	2
		Restore natural retention areas	314	High	4
2.2	Improve water retention in settlement areas (handling of precipitation water)	Decrease land sealing	312	Moderate	2
		Improve rainwater retention capacity	313	Moderate	2
2.3	Improve the discharge capacity in endangered areas	Widen the flood discharge cross-section in settlement and alluvial areas	319	High	4
		Clear and permanently secure the flood discharge cross-section	320	High	4
2.4	Reduce/restrict flood discharges	Implement a construction programme of flood retention measures	315	High	4

Obj. no.	Objective	Criteria for achieving the objective	Indicators	Impact	
		Maintain and improve flood control basins and dams	316	High	4
2.5	Improve protection against flooding, including structural precautions to existing buildings	Step up retrospective measures to protect buildings and infrastructure facilities	307	Moderate	2
		Improve stationary and mobile defence equipment	317	High	4
		Maintain existing stationary and mobile defence structures	318	High	4
2.6	Reduce the potential for damage in flood-prone settlement areas by adapting and changing land use and by improving the modified handling of substances hazardous to water	Reduce flood-sensitive uses in flood-prone areas	305	Moderate	2
		Increase flood defence in municipalities/households with substances hazardous to water	308	Moderate	2
2.7	Supplement other protective measures and create/improve the conditions for minimising existing risks	Improve flood protection and improve the conceptual framework for deriving appropriate prevention/control measures to reduce the overall flood risk.	321	Moderate	2
3	**Reduce adverse consequences during a flood**				
Obj. no.	**Objective**	**Criteria for achieving the objective**	**Indicators**	**Impact**	
3.1	Provide and improve forecasting of storm surges, floods and water levels	Improve the flood warning service and storm surge forecasting	322	High	4
		Improve municipal warning and information systems	323	Moderate	2
3.2	Improve crisis management by means of alert and operational planning	Improve alert and operational planning for municipalities and authorities	324	High	4
3.3	Educate affected residents and companies about flood risks and how to behave in the event of an incident	Raise awareness among residents and companies	325	Moderate	2
4	**Reduce adverse consequences following a flood**				
Obj. no.	**Objective**	**Criteria for achieving the objective**	**Indicators**	**Impact**	
4.1	Improve the preparation and delivery of emergency aid	Improve emergency aftercare and support of affected individuals	327	Moderate	2
4.2	Improve the preparation and implementation of environmental damage repairs	Improve aftercare with respect to environmental damage repairs	327	Moderate	2
4.3	Improve the preparation and implementation of incident and damage documentation	Improve the preparation of incident and damage documentation	328	Moderate	2

Obj. no.	Objective	Criteria for achieving the objective	Indicators	Impact	
4.4	Improve provisioning for financial losses	Improve the availability of information for affected property owners on financial risk provisioning	326	Moderate	2

For the purposes of this report, “other measures” (309, 329) and “conceptual measures” (500) have not been assigned to objectives. The heterogeneous nature of other measures creates an inconsistent chain of effects and lack of general validity, so assigning them to objectives would be superfluous. If these other measures are chosen, progress towards the achievement of objectives can be added individually with a suitable text in the FRM plan. The impacts of conceptual measures are almost impossible to gauge and can only be qualified with specific reference to content. These conceptual measures are documented separately for the river basin.

Implementation parameters and impact

In a subsequent step, the Excel tool multiplies the implementation parameter for each indicator (=LAWA measure) and APSFR by the impact. The result represents the contribution to progress made towards achieving the relevant objective.

APSFR_ID	APSFR Code	Measure Code	APSFR_MN	Summe pro LAWA-Maßn.	Anzahl Zeilen pro LAWA-Maßn.	Durchschn. Umsetzungsstand im APSFR	Effekt	Fortschritts-beitrag
1	#APSFR-Code 1	302	#APSFR-Code 1_302	6	2	3,00	4	12,00
1	#APSFR-Code 1	303	#APSFR-Code 1_303	150	83	1,81	4	7,23
1	#APSFR-Code 1	304	#APSFR-Code 1_304	60	55	1,09	2	2,18
1	#APSFR-Code 1	305	#APSFR-Code 1_305	0	0	0,00	2	0,00
1	#APSFR-Code 1	306	#APSFR-Code 1_306	15	5	3,00	2	6,00
1	#APSFR-Code 1	307	#APSFR-Code 1_307	519	222	2,34	2	4,68
1	#APSFR-Code 1	308	#APSFR-Code 1_308	568	192	2,96	2	5,92
1	#APSFR-Code 1	310	#APSFR-Code 1_310	113	78	1,45	2	2,90
1	#APSFR-Code 1	311	#APSFR-Code 1_311	53	56	0,95	2	1,89
1	#APSFR-Code 1	312	#APSFR-Code 1_312	52	29	1,79	2	3,59
1	#APSFR-Code 1	313	#APSFR-Code 1_313	52	29	1,79	2	3,59
1	#APSFR-Code 1	314	#APSFR-Code 1_314	26	43	0,60	4	2,42
1	#APSFR-Code 1	315	#APSFR-Code 1_315	21	14	1,50	4	6,00
1	#APSFR-Code 1	316	#APSFR-Code 1_316	36	15	2,40	4	9,60
1	#APSFR-Code 1	317	#APSFR-Code 1_317	12	11	1,09	4	4,36
1	#APSFR-Code 1	318	#APSFR-Code 1_318	31	12	2,58	4	10,33
1	#APSFR-Code 1	319	#APSFR-Code 1_319	123	41	3,00	4	12,00
1	#APSFR-Code 1	320	#APSFR-Code 1_320	129	43	3,00	4	12,00
1	#APSFR-Code 1	321	#APSFR-Code 1_321	0	0	0,00	2	0,00
1	#APSFR-Code 1	322	#APSFR-Code 1_322	12	4	3,00	4	12,00
1	#APSFR-Code 1	323	#APSFR-Code 1_323	97	59	1,64	2	3,29
1	#APSFR-Code 1	324	#APSFR-Code 1_324	436	204	2,14	4	8,55
1	#APSFR-Code 1	325	#APSFR-Code 1_325	126	42	3,00	2	6,00
1	#APSFR-Code 1	326	#APSFR-Code 1_326	321	139	2,31	2	4,62
1	#APSFR-Code 1	327	#APSFR-Code 1_327	274	118	2,32	2	4,64
1	#APSFR-Code 1	328	#APSFR-Code 1_328	0	0	0,00	2	0,00

<Legende>:

Sum total per LAWA meas.

No. of lines per LAWA meas.

Ave. implementation status in the APSFR

Impact of criterion

Contribution to progress

Figure 9: Example of automated calculation of the contribution made by individual LAWA measures to progress in the APSFR (fictitious example). This worksheet is greyed out in the Excel tool.

In the above example, the average implementation status (= implementation parameter) for LAWA measure no. 306 in the APSFR "#APSFR-Code1" is 3.00. The impact is therefore classified as "moderate" = 2 for LAWA measure no. 306. The implementation parameter (3.00) multiplied by the impact (2) produces a progress contribution of 6.00 for LAWA measure 306 in this APSFR. These progress contributions from the individual indicators are then used to calculate the progress level of the individual objectives and overarching objectives. To this end, the progress contributions are weighted with the respective measure.

LAWA measure no. 306 is assigned to the sub-objective 1.4. In this example, the LAWA measure in “APSFR-Code 1” has a progress contribution of 6.0 (cf. Figure 9). From this progress contribution, suitably weighted for sub-objective 1.4 (= 0.5 for impact 2), this produces a progress contribution of 12.00 for sub-objective 1.4 (see Figure 10).

APSFR Code	Faktor im Nenner der Wichtung - 0,5 je relevanter Effekt 2 Maßnahme und 1 je relevanter Effekt 4 Maßnahme						gewichtete Fortschrittsbeiträge im OZ1 (zur Übersetzung in verbale Bewertung)					
	Ziel 1.1	Ziel 1.2	Ziel 1.3	Ziel 1.4	Ziel 1.5	Summe OZ1	Ziel 1.1	Ziel 1.2	Ziel 1.3	Ziel 1.4	Ziel 1.5	Oberziel 1
#APSFR-Code 1	2	1	0.5	0.5	0.5	4.5	5.61	12.00	4.36	12.00	11.83	8.29
#APSFR-Code 2	2	1	0.5	0.5	0.5	4.5	8.71	12.00	6.63	12.00	11.68	9.90
#APSFR-Code 3	2	1	0.5	0.5	0.5	4.5	7.34	12.00	3.28	12.00	11.36	8.89

Figure 5: Example of the weighting and weighted progress contributions of the overarching and subordinate objectives (fictitious example) – this spreadsheet is greyed out in the Excel tool.

<Legende>

Factor in the weighting denominator – 0.5 per relevant impact 2 measure and 1 per relevant impact 4 measure

Objective 1.1

Objective 1.2 …

Sum total OO1

Weighted progress contributions in overarching objective 1 (OO1) (for conversion into a verbal assessment

Objective 1.1

Objective 1.2

…

Overarching objective 1

The same procedure is applied as with the overarching objectives, but first an analysis is undertaken to determine whether all objectives are actually relevant to the calculation (see below). Objectives which are not relevant for the APFSR and therefore not listed below are not included in the average figures to assess progress towards the overarching objective.

APSFR Code	Ziel 2.1	Ziel 2.2	Ziel 2.3	Ziel 2.4	Ziel 2.5	Ziel 2.6	Ziel 2.7	Oberziel 2	Ziel 2.1	Ziel 2.2	Ziel 2.3	Ziel 2.4	Ziel 2.5	Ziel 2.6	Ziel 2.7	Oberziel 2
#APSFR-Code 1	2	1	2	2	2.5	1	0	10.5	3.60	7.17	12.00	7.80	7.75	5.92	n.rel.	7.55
#APSFR-Code 2	2	1	2	2	2.5	1	0	10.5	5.26	8.64	12.00	9.13	9.28	5.84	n.rel.	8.61
#APSFR-Code 3	2	1	2	2	2.5	1	0	10.5	2.15	4.00	12.00	6.51	7.57	5.68	n.rel.	6.66

<Legende>

Objective 2.1

Obective 2.2 …

Overarching objective 2

Figure 11: Non-relevant objectives are not included in calculation of the overarching objective

In the following example for overarching objective 1, the sum totals of the progress contributions of the sub-objectives are divided by the sum total of weighting factors.

APSFR Code	mittlerer Realisierungsparameter je LAWA-Maßnahme je APSFR (Übertrag aus Tabelle Berechnung)							Faktor im Nenner der Wichtung - 0,5 je relevanter Effekt 2 Maßnahme und 1 je relevanter Effekt 4 Maßnahme						gewichtete Fortschrittsbeiträge im OZ1 (zur Übersetzung in verbale Bewertung)					
	301	302	303	304	305	306	308	Ziel 1.1	Ziel 1.2	Ziel 1.3	Ziel 1.4	Ziel 1.5	Summe OZ1	Ziel 1.1	Ziel 1.2	Ziel 1.3	Ziel 1.4	Ziel 1.5	Oberziel 1
#APSFR-Code 1	4	12	7.23	2.18	0	6	5.92	2	1	0.5	0.5	0.5	4.5	5.61	12.00	4.36	12.00	11.83	8.29
#APSFR-Code 2	9.33	12	8.08	3.32	0	6	5.84	2	1	0.5	0.5	0.5	4.5	8.71	12.00	6.63	12.00	11.68	9.90
#APSFR-Code 3	8	12	6.69	1.64	0	6	5.68	2	1	0.5	0.5	0.5	4.5	7.34	12.00	3.28	12.00	11.36	8.89

<Legende>

Mean implementation parameter per LAWA measure for each APSFR (carried forward from calculation table)

Factor in weighting denominator – 0.5 per relevant impact 2 measure and 1 per relevant impact 4 measure

Objective 1.1

Ojective 1.2 …

Sum total OO1

Weighted progress contributions in overarching objective 1 (OO1)

(For conversion into a verbal evaluation)

Objective 1.1

Objective 1.2

Overarching objective 1

Hence, for overarching objective 1 of “APSFR-Code 1”, this produces a weighted progress contribution of 8.29. This equates to a classification of “+++”, major progress (see Table 6).

The progress towards all objectives and the associated overarching objective is calculated in this way.

Initially, progress is assessed for each APSFR. The numerical value is graded in a verbal progress description using the five-point scale.

Table 6: 5-point scale for evaluating progress

Value range	Symbol	Verbal designation
0.0 to # 2.0	o	no or minimal progress towards achieving the objectives
>2.0 to # 4.5	+	little progress towards achieving the objectives
>4.5 to # 7.0	++	moderate progress
>7.0 to # 9.5	+++	significant progress
>9.5 to 12.0	++++	major progress

As the evaluation of indicators is incorporated directly into the overall assessment for the overarching objective, no direct conclusions may be drawn from the individual assessments of the objectives (some of which include multiple indicators) in relation to the overarching objective (see Figure 12).

APSFR_ID	1.2 APSFR Code	Ziel 3.1	Ziel 3.2	Ziel 3.3	Oberziel 3
1	#APSFR-Code1	mittlere Fortschritte	nicht relevant	keine bzw. sehr geringe Fortschritte	mittlere Fortschritte
2	#APSFR-Code2	mittlere Fortschritte	mittlere Fortschritte	keine bzw. sehr geringe Fortschritte	geringe Fortschritte
3	#APSFR-Code3	mittlere Fortschritte	geringe Fortschritte	keine bzw. sehr geringe Fortschritte	geringe Fortschritte

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Objective 3.1

Objective 3.2

…

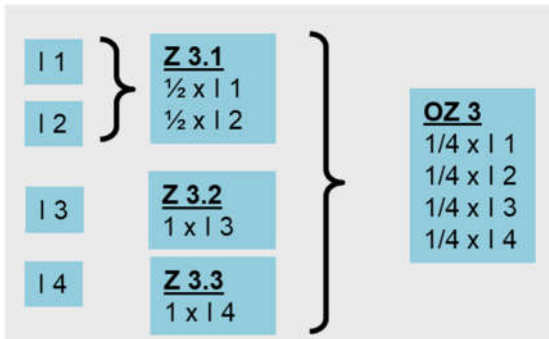
Overarching objective 3

Moderate progress

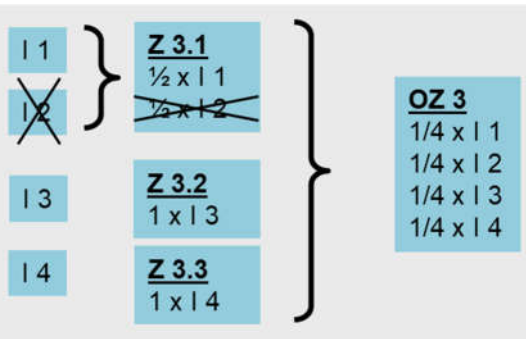
Not relevant

No or minimal progress

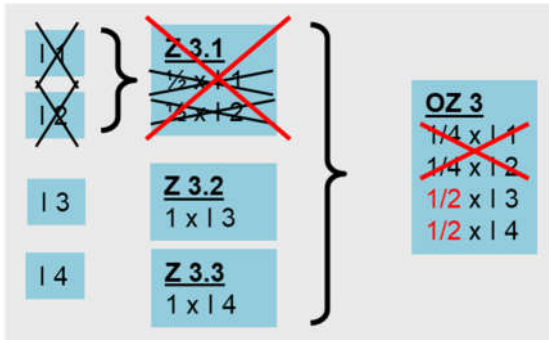
Little progress



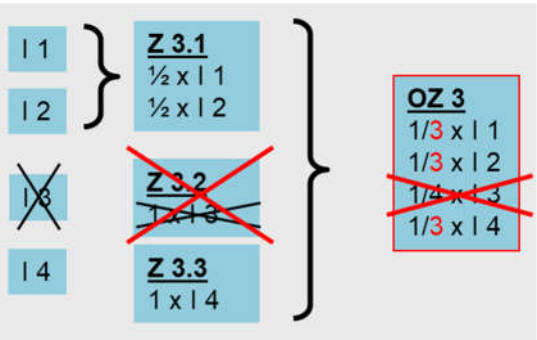
Alle Ziele sind relevant, Berechnung der Fortschritte der Ziele jeweils als Mittelwert (bei mehreren Indikatoren); Berechnung der Fortschritte zum Oberziel als Mittelwert aus allen Indikatoren.



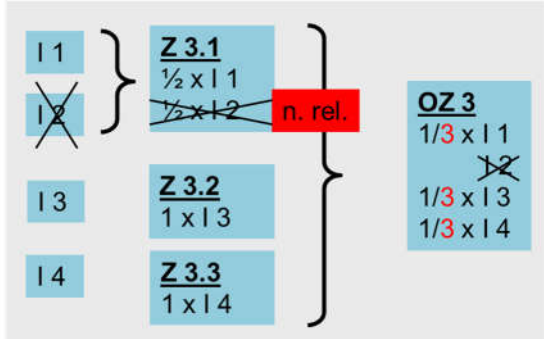
Alle Ziele sind relevant, auch wenn ein einzelner Indikator fehlt. Berechnung der Fortschritte der Ziele jeweils als Mittelwert (bei mehreren Indikatoren); Berechnung der Fortschritte zum Oberziel als Mittelwert aus allen Indikatoren



Alle Indikatoren zu einem Ziel fehlen, das Ziel ist nicht relevant. Berechnung der Fortschritte zum Oberziel als Mittelwert aus allen Indikatoren der relevanten Ziele.



Alle Indikatoren zu einem Ziel fehlen, das Ziel ist nicht relevant. Berechnung der Fortschritte zum Oberziel als Mittelwert aus allen Indikatoren der relevanten Ziele.



Eine LAWA-Maßnahme, die als Indikator zusammen mit anderen Indikatoren zu einem Ziel beiträgt, ist in einem APSFR nicht relevant. Die Berechung der Fortschritte zum Oberziel erfolgt aus den verbleibenden Indikatoren.

I = indicator; Z = objective; OZ = overarching objective

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All objectives are relevant, calculation of progress towards objectives as a mean value (with multiple indicators); calculation of progress towards the overarching objective as a mean of all indicators.

All objectives are relevant even if an individual indicator is lacking. Calculation of progress towards objectives as a mean value (with multiple indicators); calculation of progress towards the overarching objective as a mean of all indicators.

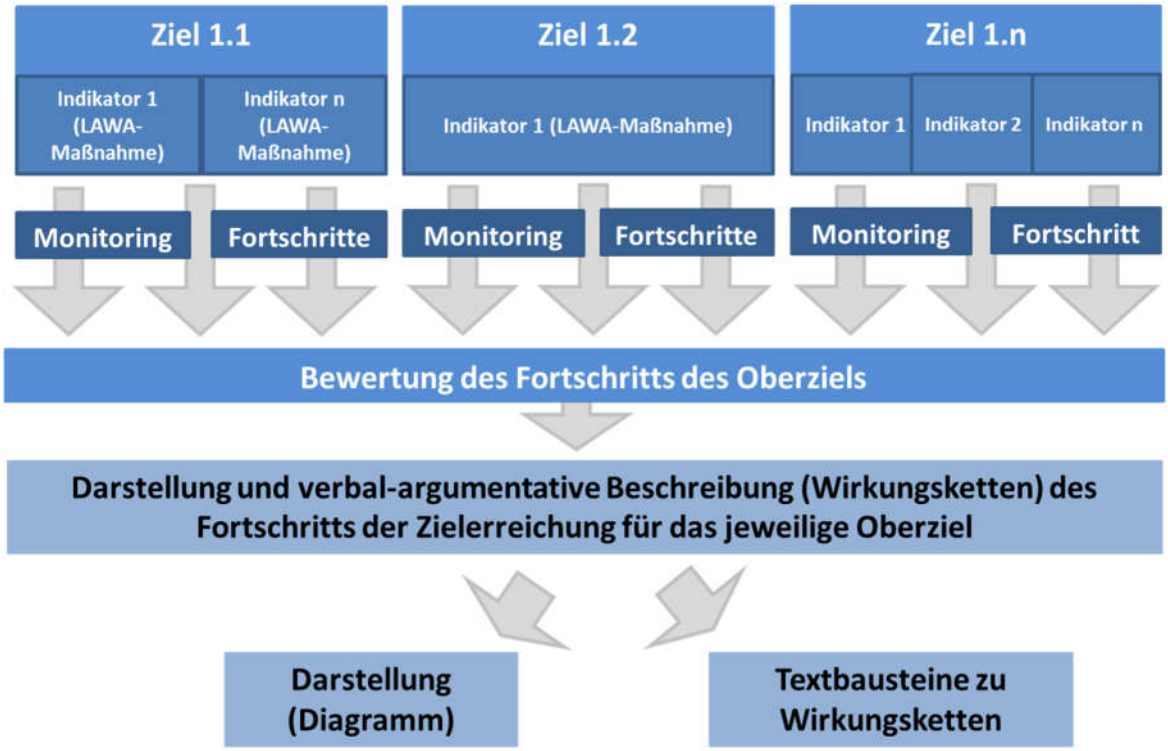
All indicators for a given objective are lacking, so this objective is irrelevant. Progress towards the overarching objective is calculated as a mean of all indicators for relevant objectives.

All indicators for a given objective are lacking, so that objective is irrelevant. Progress towards the overarching objective is calculated as a mean of all indicators for relevant objectives.

A LAWA measure with contributes to an objective as an indicator together with other indicators is not relevant in a given APSFR. Progress towards the overarching objective is calculated from the remaining indicators.

Figure 12: Examples for calculating progress towards each objective and overarching objective with due regard for irrelevant objectives and/or irrelevant indicators (fictitious)

For the purposes of documentation in the FRM plan, the individual assessments for each APSFR are then summarised in text form for each river basin, showing the progress made towards each of the objectives (see Figure 13). Text modules are available to assist with this (see chapter 6).



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Ziel 1.1 = Objective 1.1

Indikator 1 (LAWA-Maßnahme) = Indicator 1 (LAWA measure)

Indikator n (LAWA-Maßnahme) = Indicator n (LAWA measure)

Monitoring = Monitoring

Fortschritte = Progress

Evaluation of progress towards the overarching objective

Presentation and verbal description (chains of impact) of progress towards the objectives for a given overarching objective

Presentation (diagram)

Text modules on chains of effect

Figure 13: Summary of progress made towards the objectives of an overarching objective

Documenting the results

The outcome of the verbal assessments of objectives and overarching objective for the area under consideration may be copied from the presentation of results into the Excel tool for each overarching objective (see Table 7).

Table 7: Result of the summarised assessment of progress (fictitious example)

Objective	Description	Conclusion
Objective 2.1	Improve/increase natural water retention	Minimal progress
Objective 2.2	Improve water retention in settlement areas (handling of precipitation)	Moderate progress
Objective 2.3	Improve discharge capacity in at-risk areas	Major progress
Objective 2.4	Reduce/restrict flood discharge	Significant progress
Objective 2.5	Improve flood defences including existing structural defences	Significant progress
Objective 2.6	Reduce the damage potential in flood-prone settlement areas by adjusting and modifying uses and improving the adapted handling of substances hazardous to water	Moderate progress
Objective 2.7	Add further protective measures and create or improve the conditions to mitigate existing risks	Irrelevant
Sum total, overarching objective 2	**Mitigate existing risks (before a flood) in the risk area**	**Significant progress**

Table 8 below provides a sample text module with the variables to be selected for overarching objective 1.

Table 8: Text modules to document the overall progress of overarching objective 1

<table>
<tr><th>Overarching objective X
[No. of overarching objective]</th><th>[Selection based on overall result]</th><th>[Selection based on individual result of the objectives]</th><th>[Selection of objectives with equal progress]</th></tr>
<tr><td rowspan="7">For [text of overarching objective] in the period [2015-2021], overall, ...</td><td>no or minimal ...</td><td rowspan="7">=> for significant and major progress
1. In particular, measures to achieve the following objectives were implemented on a large scale: [List of relevant objectives, see right-hand column]

=> for moderate and little progress
2. Clear progress has been made towards the following objectives: [List of relevant objectives, see right-hand column]

=> for no or minimal progress
3. Efforts must be stepped up in future with regard to the following objectives: [List of relevant objectives, see right-hand column]</td><td>Improve land precautions by incorporating flood risks into spatial and sectoral planning</td></tr>
<tr><td>little ...</td><td>Protect land to prevent new risks and conserve water retention within spatial planning</td></tr>
<tr><td>moderate ....</td><td>Increase the ratio of flood-adapted (land) use</td></tr>
<tr><td>significant ...</td><td>Improve building precautions for new buildings and renovations (flood-adapted construction methods)</td></tr>
<tr><td>major ...</td><td rowspan="3">Improve flood-adapted handling (storage, processing) of substances hazardous to water</td></tr>
<tr><td>... progress has been made.</td></tr>
<tr><td></td></tr>
<tr><td colspan="4">red font: parameters to be selected
blue font: specified texts (e.g. text for the overarching objective; associated text for the selected degree of progress)</td></tr>
</table>

The relevant degree of progress ("major" and "significant") is summarised in greater detail using the relevant chains of effect. Table 9 contains sample text modules created for overarching objective 1.

Table 9: Selection of text modules for objectives with significant and major progress to describe the impacts towards achieving overarching objective (OO) 1

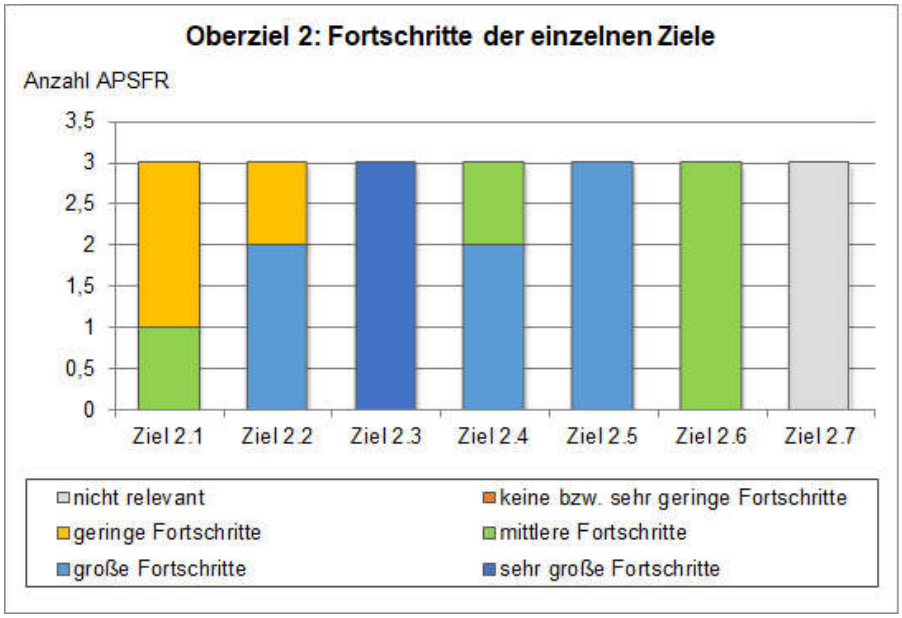
Description of progress towards OO 1:	**[Selection of objectives with significant/major progress]**		**[Text module depending on the selected objective]:**
Significant or major progress has been made with the following objectives: [Select according to evaluation result in list form]	Improve land precautions by incorporating flood risks into spatial and sectoral planning	In conclusion, the following improvements have been achieved: [automatic assignment to the corresponding objective]	Flood risks are adequately considered in spatial planning, so that new risks can be avoided. Spatial plans indicate the retention function of the land in question. Development planning requirements preclude building on at-risk areas or stipulate certain restrictions. Implementing these measures prevents or controls the occurrence of new risks.
	Protect land to prevent new risks and conserve water retention within spatial planning		Settlement activity in these areas has been significantly restricted, and the construction of new buildings is generally prohibited. This prevents any increase in new risks (settlements, infrastructure) and precludes any further loss of retention surface, helping to avoid future risks associated with exacerbated runoff below. Overall, positive effects have been achieved to reduce potential flood damage.
	Increase the ratio of flood-adapted (land) use		Adapting land use prevents the development of new damage potential on affected land or at least limits it to an acceptable level.
	Improve building precautions for new buildings and renovations (flood-adapted construction methods)		New risks associated with increased flood damage potential have been avoided. Local damage to property and infrastructure facilities has been avoided, thanks to flood-adapted land use, the elevation of parts of buildings or the installation of water- and pressure-tight windows at flood level.
	Improve flood-adapted handling (storage, processing) of substances hazardous to water		An increase in the risk of significant water pollution from IED installations, Seveso III establishments and AwSV facilities (i.e. not applicable to private households or municipalities) has been prevented.
red font: parameters to be selected blue font: specified texts (selection of the objective and corresponding impact text)			

From these text modules, only those where significant/major progress has been achieved in the relevant area (survey area, river basin etc.) are selected and documented.

The text modules for all overarching objectives and objectives can be found in chapter 6.

Furthermore, if required, the number of APSFRs where progress has been achieved is documented in the Annex to the FRM plan. The FRM plan does not provide for more in-depth documentation of each APSFR, as this would be impossible to present clearly in an annex given the large numbers of APSFRs in some regions.

There is a bar chart for this documentation showing the sub-objectives, as well as a pie chart showing the result for the relevant overarching objective.



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Overarching objective 2: Progress with individual objectives

No. of APSFRs

Objective 2.1

Objective 2.2 …

Not relevant

Minimal progress

Significant progress

No or very little progress

Moderate progress

Major progress

Figure 14: Diagram documenting the progress made towards each objective in relation to the progress in each APSFR (fictitious example)

<Legende>

Overarching objective 2: Overall progress towards achievement of the objective

Number of APSFRs with the outcome:

No or very little progress

Minimal progress

Moderate progress

Significant progress

Major progress

Not relevant

Figure 15: Diagram documenting the progress made towards the objectives for one overarching objective with reference to the progress in each APSFR (fictitious example)

Note: from the 3rd cycle onwards, the progress from the preceding cycles should be documented in order to elucidate the overall progress in each case.

Documenting the 500 series of measures

To document the implementation and impact of conceptual measures, a table showing the contribution towards the objectives of the conceptual measures implemented is incorporated into the FRM plan. It is not generally possible to determine the direct effects of conceptual measures on specific objectives, nor is it possible to gauge their impact in terms of achieving the objectives.

Details of the conceptual measures designed and implemented to accompany the 300 series of measures are generally recorded for the entire FRM plan or for specific planning areas, planning units or similar. To this end, the 500 series of measures and their implementation status is recorded in exactly the same way as the other measures. However, their implementation is not assessed in any further detail, i.e. it is not offset against the impact and the progress contribution calculated. Based on the level of implementation, the contribution of the 500 series of measures towards the achievement of objectives is classified into three categories:

- no/minimal contribution
- moderate contribution
- significant contribution

A paragraph in the specimen text documents the supportive effect of these measures and indicates that they primarily aid implementation of the 300 series of measures.

To this end, a table lists which of the 500 series of measures are implemented in the respective FRM plan.

Table 10: Documenting the progress of conceptual measures

LAWA measure no.	**Description**	**Contribution towards the objectives of implementing the measure [select according to the assessment result]**
501	Prepare concepts/studies/expert reports	• irrelevant • no/minimal contribution • moderate contribution • significant contribution
502	Research, development and demonstration projects	ditto
503	Information and training measures	ditto
504	Consultancy measures	ditto
505	Establish / adapt support programmes	ditto
506	Voluntary cooperation	ditto
507	Certification systems	ditto
508	In-depth investigations and controls	ditto
509	Studies into climate change	ditto
510	Other additional measures as per Article 11 (5) of the WFD	ditto
511	Introduce and support a heavy rainfall risk management system at municipality level	ditto
red font: parameters selected according to the evaluation result		

Individual explanatory comments on the conceptual measures may also be incorporated into the FRM plan.

5 Background: Criteria, chains of effects and impacts for achieving the overarching objectives

5.1 Overarching objective 1: Prevent new risks (before a flood) in the flood risk area

The first overarching objective addresses **new risks** in the flood risk area, whose occurrence is to be avoided. This means that all planned and future developments play a role with this overarching objective. There are two different approaches:

- Prevent settlement activity and/or adapt land uses in flood-prone areas to limit any **increase in potential damage** and affected individuals (i.e. limit the risks).
- Prevent **increased flooding risks** by maintaining the runoff and retention function in and around the water body and on surrounding land.

Table 11: Overview of objectives and criteria for achieving overall objective 1

Obj. no.	Overarching objective 1: Prevent new risks (before a flood) in the flood risk area	Criteria for achieving the objective
1.1	Improve land precautions by incorporating flood risks into spatial and sectoral planning	Criterion: Develop land protected by planning restrictions (land precautions) Criterion: Incorporate water management aspects more widely into the preparation, amendment and updating of zoning plans
1.2	Protect land to prevent new risks and conserve water retention within spatial planning	Criterion: Develop the protection of retention areas including usage restrictions
1.3	Increase the ratio of flood-adapted (land) use	Criterion: Increase flood-adapted (land) use
1.4	Improve building precautions for new buildings and renovations (flood-adapted construction methods)	Criterion: Give more consideration to flood defence when selecting sites and granting building permission
1.5	Improve flood-adapted handling (storage, processing) of substances hazardous to water	Criterion: Give more consideration to flood prevention in IEC installations, Seveso III establishments and AwSV facilities

Objective 1.1: Improve land precautions by incorporating flood risks into spatial and sectoral planning

Criterion 1: Develop land protected by planning restrictions (land precautions)

The implementation status of **LAWA measure 301** is used as an indicator to gauge any positive developments in areas protected by planning restrictions over a given cycle. This measure aims to identify priority and restricted areas in regional and zoning plans.

> *Definition according to the LAWA-BLANO catalogue of measures:*
>
> *Identify existing priority and restricted areas in the regional and zoning plans as well as those still lacking. Also, adapt regional plans, protect retention areas, modify land use and make land available for flood defence and waterbody development.*

Identifying restricted and priority areas for flood-prone land discloses flood risk information for all spatial planning and land use claims. Risks are incorporated into spatial planning in line with the relevant objectives and principles, and essential precautions are taken to prevent damage. By protecting the retention function in affected areas, any loss of retention land and associated deterioration in the runoff situation is prevented, which in turn helps to avert new risks.

Measures are implemented at state or regional planning level and their impacts are therefore area-wide if implemented successfully. Implementation is legally binding (for government authorities) and the effects are permanent for as long as the regional plan remains valid. Since the actual effectiveness of land precautions relies on subsequent implementation within the context of planning procedures, the impact is indirect and generally occurs with a time lag.

In qualitative terms, the measure's contribution to the achievement of objective 1.1 (i.e. its impact) can be assessed as follows:

Impact 301 / Criteria	high (4 points)	moderate (2 points)	low (1 point)
Causality between measure - objective	direct	indirect	-
Effectiveness range of the measure in the APSFR	area-wide	sub-regional	individual areas / properties*
Onset of effect	immediate	with a delay	-
Persistence/continuity of the measure's effect	permanent	regular implementation required	one-off
Validity/binding force	legally binding	anchored in concepts	non-binding, voluntary implementation

NOTE: When measuring the achievement of objectives, this criterion may be further developed by including the proportion of measures already implemented in the APSFR. If all regional plans for a given area include such representations, the objective will have been 100% fulfilled. This entails comparing the number of measures actually implemented

against the theoretical total number of measures (regional plans) in a given state or river basin district.

Criterion 2: Give greater consideration to water management information when preparing, amending and updating zoning plans

The indicator for the second criterion is the implementation status of **LAWA measure 303**.

Definition according to the LAWA-BLANO catalogue of measures:

Amend and/or modify development planning and building regulations; amend and/or update zoning plans; conduct reviews to ensure that flood protection concerns are incorporated into new zoning plans and/or building regulations.

Adapting and/or modifying zoning plans to incorporate water management information about flood control is an important land precaution. Zoning plans may stipulate that flood-prone areas must not be built on at all, or only subject to certain restrictions. Implementing this measure therefore directly prevents or limits the occurrence of future risks.

Measures are implemented at local authority level and are legally binding. Their effects are area-wide if implemented in full. However, it is important to ensure that they are subsequently re-applied to any new development plans.

In qualitative terms, the measure's contribution to the achievement of objective 1.1 (i.e. its impact) can be assessed as follows:

Impact 303 / Criteria	high (4 points)	moderate (2 points)	low (1 point)
Causality between measure - objective	direct	indirect	-
Effectiveness range of the measure in the APSFR	area-wide	sub-regional	individual areas / properties*
Onset of effect	immediate	with a delay	-
Persistence/continuity of the measure's effect	permanent	regular implementation required	one-off
Validity/binding force	legally binding	anchored in concepts	non-binding, voluntary implementation

NOTE: When measuring the achievement of objectives, the criterion may be further developed by including the proportion of measures already implemented in the APSFR. If all local authorities in a given region incorporate this information into their zoning plans, the objective will have been 100% fulfilled. However, this entails comparing the number of measures actually implemented against the theoretical total number of measures (local authorities) in that state or river basin district.

Objective 1.2: Protect land to prevent new risks and conserve water retention within spatial planning

The progress made with objective 1.2 is measured against two criteria.

Criterion: Develop the protection of retention areas including usage restrictions

The progressive protection of retention areas, in other words, expanding such areas in flood-prone regions, contributes significantly to protecting the area by preserving water retention.

The implementation status of **LAWA measure 302** serves as an indicator.

> *Definition according to the LAWA-BLANO catalogue of measures:*
>
> *Define and/or update flood plains and water legislation to restrict use. Grant legal protection to areas as flood plains; identify and provisionally protect flood plains that have not yet been formally established, restore former flood plains; formulate and establish usage restrictions in flood plains, adopt a legal definition of flood origination areas.*

This means defining and updating flood zones and adopting usage restrictions under water legislation. For example, new housing developments are prohibited in flood zones, unless explicitly permitted by Article 78 (2) of the Federal Water Act (WHG). In addition, flood-adapted construction methods are prescribed for these exceptional cases. Protecting areas where a flood event is statistically expected to occur once in 100 years by designating them as flood zones allows settlement activity to be restricted to prevent increased risks in the future, since no new settlements or infrastructure can be built. At the same time, these areas can assist with water retention in the area. Increasing retention areas helps to minimise the potential for flood-related damage and prevent a further exacerbation in the runoff situation in downstream areas.

In qualitative terms, this measure's contribution to the achievement of objective 1.2 (i.e. its impact) can be assessed as follows:

Impact 302 / Criteria	high (4 points)	moderate (2 points)	low (1 point)
Causality between measure - objective	direct	indirect	-
Effectiveness range of the measure in the APSFR	area-wide	sub-regional	individual areas / properties*
Onset of effect	immediate	delayed	-
Persistence/continuity of the measure's effect	permanent	regular implementation required	one-off
Validity/binding force	legally binding	anchored in concepts	non-binding, voluntary implementation

Objective 1.3: Increase the ratio of flood-adapted (land) use

Criterion: Increase in flood-adapted (land) use

To meet this criterion and increase the ratio of flood-adapted (land) uses, additional measures must have been implemented since the previous cycle. In principle, each additional measure increases the ratio of flood-adapted (land) use.

The indicator used is the implementation status of **LAWA measure 304**, which defines measures for flood-adapted land use.

Definition according to the LAWA-BLANO catalogue of measures:

Measures for adapted land use, i.e. flood-adapted planning and measures, such as modification of existing settlements or conversion of arable land into grassland in flood-prone areas. Ongoing elimination/reduction of identified deficits, e.g. by adopting new plans to adapt infrastructure facilities.

Adapting the use of existing settlements or land e.g. with modified transport or settlement concepts helps to eliminate or minimise the potential for additional damage. Preventing additional flood-prone uses in at-risk areas helps to avoid new risks. Carefully planned flood-proof uses may survive a flood event largely unscathed. Land use adaptation occurs at individual plot level, and responsibility rests with different stakeholders (land-owners). There is no legally binding basis; implementation is voluntary. Once implemented, adaptation may have a permanent effect initially, but this may also be reversed (e.g. following a change of ownership).

In qualitative terms, this measure's contribution to the achievement of objective 1.3 (i.e. its impact) can be assessed as follows:

Impact 304 / Criteria	high (4 points)	moderate (2 points)	low (1 point)
Causality between measure - objective	direct	indirect	-
Effectiveness range of the measure in the APSFR	area-wide	sub-regional	individual areas / properties*
Onset of effect	immediate	delayed	-
Persistence/continuity of the measure's effect	permanent	regular implementation required	one-off
Validity/binding force	legally binding	anchored in concepts	non-binding, voluntary implementation
*Where a measure only affects a specific area or property, the impact on the APSFR as a whole will be relatively small. Evaluation of a LAWA measure may therefore suggest a moderate impact at best for such measures.			

Objective 1.4: Improve building precautions for new buildings and renovations (flood-adapted construction methods)

Criterion: Give greater consideration to flood conrol when selecting sites and granting building permission

The implementation status of **LAWA measure 306** is used as an indicator.

Definition according to the LAWA-BLANO catalogue of measures:

Flood-adapted planning, construction and renovation, i.e. flood-proof execution of infrastructures and flood-tested selection of construction sites.

Building/renovating new and existing infrastructure and buildings to flood-proof standards helps to avert new risks before a flood. Building precautions are designed to prevent new flood damage potential by incorporating relevant aspects into the planning or construction phases. Individual measures such as flood-adapted use, elevating parts of buildings or installing water- and pressure-tight windows at flood level can measurably reduce the damage to properties or infrastructure facilities at a local level. They are implemented at individual property level and the effects are permanent. Such measures tend to be voluntary, unless the municipality has made appropriate provisions in its statutes (development plan). The measures are implemented by public-sector or private developers.

In qualitative terms, this measure's contribution to the achievement of objective 1.4 (i.e. its impact) can be assessed as follows:

Impact 306 / Criteria	high (4 points)	moderate (2 points)	low (1 point)
Causality between measure - objective	direct	indirect	-
Effectiveness range of the measure in the APSFR	area-wide	sub-regional	individual areas / properties*
Onset of effect	immediate	delayed	-
Persistence/continuity of the measure's effect	permanent	regular implementation required	one-off
Validity/binding force	legally binding	anchored in concepts	non-binding, voluntary implementation
*Where a measure only affects an individual area or property, the impact on the APSFR as a whole will be relatively small. Evaluation of a LAWA measure may therefore suggest a moderate impact at best for such measures.			

Objective 1.5: Improve flood-adapted handling (storage, processing) of substances hazardous to water

Appropriate handling of substances hazardous to water is crucial for preventing new threats to protected environmental resources.

Criterion: Give greater consideration to flood defence in IED installations, Seveso III establishments and AwSV facilities

Implementing part of **LAWA measure 308**, specifically the handling of substances hazardous to water in IED installations, Seveso III establishments and AwSV facilities, helps to minimise the risk of water pollution in flood zones before a flood.

> *Definition according to the LAWA-BLANO catalogue of measures:*
>
> *Flood-adapted handling of substances hazardous to water; flood-safe storage of heating tanks. Compliance with the AwSV (design requirements for plants in contact with substances hazardous to water).*

This criterion is confined to measures relating to IED installations, Seveso III establishments and AwSV facilities (i.e. not applicable to private households or municipalities). Failure to

ensure the flood-adapted handling of substances hazardous to water can lead to serious water pollution and considerably exacerbate the potential for flood damage. Individual measures to ensure that these requirements are observed in new installations can measurably help to prevent new risks.

The measures are implemented in individual facilities by the operators and are only legally binding in defined flood plains. In areas at risk of flooding ($HQ_{extreme}$), implementation is voluntary.

In qualitative terms, the measure's contribution to the achievement of objective 1.5 (i.e. its impact) can be assessed as follows:

Impact 308 / Criteria	high (4 points)	moderate (2 points)	low (1 point)
Causality between measure - objective	direct	indirect	-
Effectiveness range of the measure in the APSFR	area-wide	sub-regional	individual areas / properties*
Onset of effect	immediate	delayed	-
Persistence/continuity of the measure's effect	permanent	regular implementation required	one-off
Validity/binding force	legally binding	anchored in concepts	non-binding, voluntary implementation
*Where a measure only affects an individual area or property, the impact on the APSFR as a whole will be relatively small. Evaluation of a LAWA measure may therefore suggest a moderate impact at best for such measures.			

5.2 Overarching objective 2: Reduce existing risks (before a flood) in the risk area

The second overarching objective addresses existing risks in flood-prone areas. The aim is to take appropriate measures to reduce or eliminate these existing risks by focusing on improving natural water retention to reduce the risk of flooding, as well as reducing susceptibility to damage (adaptation to risks) and reducing the existing potential for damage.

Table 12: Overview of objectives and criteria for the achievement of overarching objective 2

Obj. no.	Overarching objective 2: Reduce existing risks (before a flood) in the risk area	Criteria for achieving the objective
2.1	Improve/increase natural water retention	Criterion 1: Increase the amount of agricultural land with flood-minimising management practices Criterion 2: Progressively renature/reactivate water bodies, alluvial areas and former wetlands Criterion 3: Reclaim natural retention areas
2.2	Improve water retention in settlement areas (handling of precipitation water)	Criterion 1: Reduce land sealing Criterion 2: Improve rainwater retention capacity
2.3	Improve the discharge capacity in at-risk areas	Criterion 1: Widen the flood discharge cross-section in human settlements and alluvial areas Criterion 2: Clear and maintain the flood discharge cross-section
2.4	Reduce/restrict flood discharges	Criterion 1: Implement programmes to build flood defences Criterion 2: Maintain and improve flood control basins and dams
2.5	Improve flood protection including structural precautions to existing buildings	Criterion 1: Step up retrospective structural measures to protect buildings and infrastructure facilities Criterion 2: Improve stationary and mobile protective equipment Criterion 3: Maintain existing stationary and mobile flood defences
2.6	Reduce the potential for damage in flood-prone settlement areas by adapting/changing land use and by improving the modified handling of substances hazardous to water	Criterion 1: Reduce flood-sensitive uses in flood-prone areas Criterion 2: Boost flood defence measures in municipalities/households with substances hazardous to water
2.7	Supplement other protective measures and create or improve the conditions for reducing existing risks	Criterion 1: Encourage the design of suitable protective/precautionary measures to reduce the overall flood risk.

Objective 2.1: Improve/increase natural water retention

Criterion 1: Increase the amount of agricultural land with flood-minimising management practices

The implementation status of **LAWA measure 310** on flood-minimising land management serves as an indicator of compliance with this criterion.

Definition according to the LAWA-BLANO catalogue of measures:

Flood-minimising land management refers to practices that promote natural water retention to maintain and improve the water storage potential of soils and ecosystems. Examples of agricultural and forestry land practices might include zero tillage, catch crops and undersowing, afforestation, forest conversion, etc., as well as incorporating suitable flood-minimising land management programmes into regional planning, zoning plans, Natura 2000, WFD plans etc.

Flood-minimising land management, such as zero tillage or forest conversion, increases the water storage capacity of the affected soils. This helps to cushion runoff peaks and reduce the potential for erosion and damage. The larger the area managed with flood-minimising practices, the more flood risks in that area can be minimised.

The measures are implemented by farmers and foresters and may be accompanied and promoted by suitable concepts and programmes. There is no binding legal foundation. A direct impact will only be felt if the measures are actually implemented on the land. They will need to be repeated for each cultivation cycle.

In qualitative terms, this measure's contribution to the achievement of objective 2.1 (i.e. its impact) can be assessed as follows:

Impact 310 / Criteria	high (4 points)	moderate (2 points)	low (1 point)
Causality between measure - objective	direct	indirect	-
Effectiveness range of the measure in the APSFR	area-wide	sub-regional	individual areas / properties*
Onset of effect	immediate	delayed	-
Persistence/continuity of the measure's effect	permanent	regular implementation required	one-off
Validity/binding force	legally binding	anchored in concepts	non-binding, voluntary implementation

Criterion 2: Progressively renature/reactivate waterbodies, alluvial areas and former wetlands

The implementation status of **LAWA measure 311** for the renaturation of waterbodies and alluvial areas serves as an indicator of compliance with the criterion.

> *Definition according to the LAWA-BLANO catalogue of measures:*
>
> *Waterbody development and renaturation of alluvial areas, activation of former wetlands. Implement measures to promote natural water retention in the land to maintain and improve the water storage capacity of the soils and ecosystems, such as modified extensive watercourse maintenance; activation of former wetlands; promotion of near-natural water meadow development, near-natural design of riverbanks, near-natural widening of the river bed, reconnection of terrain structures (such as backwaters and tributaries) with retention potential.*

Implementing the measure, for example by promoting the near-natural development of alluvial areas or reconnecting terrain structures (backwaters and tributaries), increases the water storage capacity of the affected soils and ecosystems and broadens the retention area. This helps to cushion runoff peaks and reduce the potential for erosion and damage. The larger the area managed with these types of measures, the more flood risks in that area can be minimised.

The measures are implemented voluntarily by farmers and foresters or by the municipalities. Once renaturation/reactivation is successful, the effect is permanent.

In qualitative terms, this measure's contribution to the achievement of objective 2.1 (i.e. its impact) can be assessed as follows:

Impact 311 / Criteria	high (4 points)	moderate (2 points)	low (1 point)
Causality between measure - objective	direct	indirect	-
Effectiveness range of the measure in the APSFR	area-wide	sub-regional	individual areas / properties*
Onset of effect	immediate	delayed	-
Persistence/continuity of the measure's effect	permanent	regular implementation required	one-off
Validity/binding force	legally binding	anchored in concepts	non-binding, voluntary implementation

Criterion 3: Reclaim natural retention areas

The implementation status of **LAWA measure 314** on reclaiming natural retention areas serves as an indicator of compliance with this criterion.

> *Definition according to the LAWA-BLANO catalogue of measures:*
>
> *Reclaim natural retention areas and promote natural water retention in the land by removing/relocating/renaturing flood defences that are no longer required (dikes, walls), soil mounds etc., reactivating suitable former flood plains etc.*

Measures such as the removal, relocation or renaturation of dikes and walls that are no longer required helps to promote natural water retention. Floodplains and water meadows that were previously cut off from the water body can also be reactivated. The reactivated flood plains fulfil their original function more effectively and help to create additional retention space in case of flooding. The more natural retention areas can be reclaimed, the more retention space is available in the event of a flood, which in turn helps to minimise the risks.

The measures are implemented by the municipalities and their effect is permanent as soon as they are completed. They are voluntary.

In qualitative terms, the measure's contribution to the achievement of objective 2.1 (i.e. its impact) can be assessed as follows:

Impact 314 / Criteria	high (4 points)	moderate (2 points)	low (1 point)
Causality between measure - objective	direct	indirect	-
Effectiveness range of the measure in the APSFR	area-wide	sub-regional	individual areas / properties*
Onset of effect	immediate	delayed	-
Persistence/continuity of the measure's effect	permanent	regular implementation required	one-off
Validity/binding force	legally binding	anchored in concepts	non-binding, voluntary implementation

Objective 2.2: Improve water retention in settlement areas (handling of precipitation water)

Criterion 1: Reduce land sealing

The implementation status of **LAWA measure 312** to reduce land sealing, specifically by unsealing, serves as an indicator of compliance with the criterion.

> *Definition according to the LAWA-BLANO catalogue of measures:*
>
> *Reduce land sealing and promote natural water retention in the area by unsealing land and reducing uncompensated new sealing, especially in areas with increased precipitation or runoff.*

Unsealing allows rainwater in settlement areas to leach directly into the soil and be retained. This reduces the amount of precipitation water that flows directly into waterbodies or drainage systems and helps to reduce or equalise flood runoff peaks in settlement areas.

The measures are carried out voluntarily by public and private developers and have a permanent effect. They tend to be small-scale measures on individual plots of land.

In qualitative terms, this measure's contribution to the achievement of objective 2.2 (i.e. its impact) can be assessed as follows:

Impact 312 / Criteria	high (4 points)	moderate (2 points)	low (1 point)
Causality between measure - objective	direct	indirect	-
Effectiveness range of the measure in the APSFR	area-wide	sub-regional	individual areas / properties*
Onset of effect	immediate	delayed	-
Persistence/continuity of the measure's effect	permanent	regular implementation required	one-off
Validity/binding force	legally binding	anchored in concepts	non-binding, voluntary implementation
*Where a measure only affects an individual area or property, the impact on the APSFR as a whole will be relatively small. Evaluation of a LAWA measure may therefore suggest a moderate impact at best for such measures.			

NOTE: One option for measuring the achievement of objectives could be to define a target value for unsealing within the cycle based on the current level of sealing in a river basin (e.g. 10% per cycle) and regularly record the current level of sealing or the extent of unsealing actually implemented.

Criterion 2: Improve rainwater retention capacity

The implementation status of **LAWA measure 313** on rainwater management serves as an indicator of compliance with the criterion.

> *Definition according to the LAWA-BLANO catalogue of measures:*
>
> *Rainwater management; measures to retain water e.g. by means of municipal retention systems to balance the runoff, systems to improve seepage (including rainwater infiltration systems, trough-trench systems), other systems that use rainwater in public areas, green roofs etc.*

Rainwater retention measures allow rainwater to infiltrate from other structures (e.g. via green roofs), or to be collected, retained and allowed to seep away over a longer period of time (for example, using trough-trench systems). This reduces the amount of precipitation water flowing directly into waterbodies or drainage systems and helps to reduce or equalise flood runoff peaks in settlement areas.

The measures are implemented by the municipalities or property owners based on local authority concepts and have a permanent effect once implemented.

In qualitative terms, this measure's contribution to the achievement of objective 2.2 (i.e. its impact) can be assessed as follows:

Impact 313 / Criteria	high (4 points)	moderate (2 points)	low (1 point)
Causality between measure - objective	direct	indirect	-
Effectiveness range of the measure in the APSFR	area-wide	sub-regional	individual areas / properties*
Onset of effect	immediate	delayed	-
Persistence/continuity of the measure's effect	permanent	regular implementation required	one-off
Validity/binding force	legally binding	anchored in concepts	non-binding, voluntary implementation

Objective 2.3: Improve the discharge capacity in at-risk areas

Criterion 1: Widen the flood discharge cross-section in human settlements and alluvial areas

The implementation status of **LAWA measure 319** serves as an indicator of compliance with this criterion.

> *Definition according to the LAWA-BLANO catalogue of measures:*
>
> *Clear and widen the flood discharge cross-section in human settlements and alluvial areas, remove bottlenecks and obstructions from the watercourse (bridges, culverts, weirs, other discharge obstructions) and widen the discharge cross-section in the alluvial area, e.g. by means of suitable excavations.*

Measures to maintain or increase runoff capacity, especially in human settlements, includes the removal of obstructions and bottlenecks, including vegetation and accretion. This ensures that the flood discharge capacity is increased or at least maintained while also helping to prevent the river bursting its banks. The discharge capacity in and upstream of settlements is maintained or improved, which in turn helps to minimise the flood risk.

The measures are implemented by municipalities, associations, the water industry and individual owners, usually on the basis of suitable concepts. Once a measure has been implemented, its effect is generally permanent.

In qualitative terms, this measure's contribution to the achievement of objective 2.3 (i.e. its impact) can be assessed as follows:

Impact 319 / Criteria	high (4 points)	moderate (2 points)	low (1 point)
Causality between measure - objective	direct	indirect	-
Effectiveness range of the measure in the APSFR	area-wide	sub-regional	individual areas / properties*
Onset of effect	immediate	delayed	-
Persistence/continuity of the measure's effect	permanent	regular implementation required	one-off
Validity/binding force	legally binding	anchored in concepts	non-binding, voluntary implementation

Criterion 2: Clear and permanently maintain the flood discharge cross-section

The implementation status of **LAWA measure 320** is used as an indicator of compliance with the second criterion.

> *Definition according to the LAWA-BLANO catalogue of measures:*
>
> *Keep the flood discharge cross-section clear by means of watercourse maintenance and foreshore management measures, including desludging, removal of weeds and sediments, mowing, creating drainage channels, regulations governing agricultural land management, removal of obstructions as part of watercourse maintenance*

Watercourse maintenance measures to keep the discharge cross-section clear (including desludging and removal of weeds) and foreshore management measures (including regulations on agricultural land management) ensure that the flood discharge cross-section does not decrease over time. Removing potential obstructions helps to minimise the flood risk in at-risk areas and prevent rivers from bursting their banks. Failure to keep such areas clear may lead to a deterioration in the situation in the event of a flood.

The measures are implemented by municipalities, associations, the water industry and individual owners in individual regions, once obstructions have been identified. Each measure has a one-off effect and must be repeated as and when further obstructions are detected.

In qualitative terms, this measure's contribution to the achievement of objective 2.3 (i.e. its impact) can be assessed as follows:

Impact 320 / Criteria	high (4 points)	moderate (2 points)	low (1 point)
Causality between measure - objective	direct	indirect	-
Effectiveness range of the measure in the APSFR	area-wide	sub-regional	individual areas / properties*
Onset of effect	immediate	delayed	-
Persistence/continuity of the measure's effect	permanent	regular implementation required	one-off
Validity/binding force	legally binding	anchored in concepts	non-binding, voluntary implementation

Objective 2.4: Reduce/restrict flood discharges

Criterion 1: Implement programmes to build flood defences

The implementation status of **LAWA measure 315** serves as an indicator of compliance with the criterion.

> *Definition according to the LAWA-BLANO catalogue of measures:*
>
> *Establish, continue, accelerate and/or expand programmes to build flood defences, including the review, enlargement and construction of new flood retention basins and dams. This includes preparing flood retention plans in and around waterbodies and/or inland drainage at dike sections as well as plans for improving the technical infrastructure (such as flood control concepts) and measures affecting structures such as dams, flood retention basins, impounded rivers, canal pounds and polders, including risk assessments of existing dams and defence structures.*

Structural measures can be taken on existing flood defences to improve their retention capacity and reduce / delay discharge. This helps to retain floodwaters in a controlled manner and cushion flood peaks. In particular, building defence structures can help to minimise the damage caused by floods in at-risk areas.

The measures are implemented by the municipalities or water industry associations and are based on suitable concepts. While these concepts have only an indirect effect, the associated measures have a direct and lasting effect. Building appropriate flood defences usually affects larger sub-areas, e.g. within settlements.

In qualitative terms, this measure's contribution to the achievement of objective 2.4 (i.e. its impact) can be assessed as follows:

Impact 315 / Criteria	high (4 points)	moderate (2 points)	low (1 point)
Causality between measure - objective	direct	indirect	-
Effectiveness range of the measure in the APSFR	area-wide	sub-regional	individual areas / properties*
Onset of effect	immediate	delayed	-
Persistence/continuity of the measure's effect	permanent	regular implementation required	one-off
Validity/binding force	legally binding	anchored in concepts	non-binding, voluntary implementation

Criterion 2: Maintain and improve flood control basins and dams

The implementation status of **LAWA measure 316** on the operation, maintenance and upgrading of flood control basins and dams serves as an indicator of compliance with the criterion.

> *Definition according to the LAWA-BLANO catalogue of measures:*
>
> *Operate, maintain and upgrade flood control basins and dams. Carry out measures on structures such as dams, flood control basins, weirs, canal pounds, impounded rivers and polders.*

Maintaining or improving the retention capacity of existing flood control basins and dams enhances their usage and reliability, which in turn helps to increase flood retention capacity. Discharges are retained in flood control basins or dams to cushion the peaks.

The measures are implemented by the municipalities or water industry associations based on appropriate concepts. They must be repeated regularly to be effective. The geographical range of effectiveness depends on the individual structure.

In qualitative terms, this measure's contribution to the achievement of objective 2.4 (i.e. its impact) can be assessed as follows:

Impact 316 / Criteria	high (4 points)	moderate (2 points)	low (1 point)
Causality between measure - objective	direct	indirect	-
Effectiveness range of the measure in the APSFR	area-wide	sub-regional	individual areas / properties*
Onset of effect	immediate	delayed	-
Persistence/continuity of the measure's effect	permanent	regular implementation required	one-off
Validity/binding force	legally binding	anchored in concepts	non-binding, voluntary implementation

Objective 2.5: Improve flood protection including structural precautions to existing buildings

Criterion 1: Step up retrospective structural measures to protect buildings and infrastructure

The implementation status of **LAWA measure 307** on property protection serves as an indicator of compliance with the criterion.

Definition according to the LAWA-BLANO catalogue of measures:

Protection of buildings and infrastructure. This refers to "retroactive" measures not included in the original construction plans (distinction from 304 and 306). Examples include: Water barriers outside the property, sealing and protective measures directly on the outside and inside of the building, such as stoplogs at openings, backflow protection for the building and property drains, floor drains in rooms, installation of bulkheads and pumps at critical points, water-repellent anti-rust coating for permanent installations, vital equipment such as transformers and switch cabinets mounted externally on infrastructure facilities. Review all infrastructure and healthcare facilities and their supply / disposal and traffic routes to assess the flood risks

Retroactively protecting buildings and infrastructure by installing bulkheads and stoplogs etc. affords direct protection in the event of flooding, helping to safeguard property and minimise the immediate threat. These direct measures limit the risk to which properties in affected areas are exposed.

Private / public land and property owners are responsible for implementation, which is voluntary.

In qualitative terms, this measure's contribution to the achievement of objective 2.5 (i.e. its impact) can be assessed as follows:

Impact 307 / Criteria	high (4 points)	moderate (2 points)	low (1 point)
Causality between measure - objective	direct	indirect	-
Effectiveness range of the measure in the APSFR	area-wide	sub-regional	individual areas / properties*
Onset of effect	immediate	delayed	-
Persistence/continuity of the measure's effect	permanent	regular implementation required	one-off
Validity/binding force	legally binding	anchored in concepts	non-binding, voluntary implementation
*Where a measure only affects an individual area or property, the impact on the APSFR as a whole will be relatively small. Evaluation of a LAWA measure may therefore suggest a moderate impact at best for such measures.			

Criterion 2: Improve stationary and mobile protective equipment

The implementation status of **LAWA measure 317** on building and upgrading stationary and mobile protective equipment serves as an indicator of compliance with the criterion.

Definition according to the LAWA-BLANO catalogue of measures:

Extend, upgrade and build new stationary and mobile protective equipment. Extend/build new structures such as dikes, flood walls, dunes, beach walls, dike openings, sluices and barrages, and identify congestion points and provide backflow protection and inland drainage (e.g. via culverts, pumping stations, coarse screens, non-return valves) as well as using mobile flood defences such as stoplogs, flood gates, dike beams etc.

Building and upgrading stationary protective equipment helps to prevent flooding in at-risk areas up to the rated capacity. Alongside stationary systems, mobile flood protection systems can close the gap by helping to minimise damage in the protected area.

Measures are based on appropriate concepts and implementation is the responsibility of the municipalities, associations and disaster control authorities. The measures impact specific sub-regions or individual properties.

In qualitative terms, this measure's contribution to the achievement of objective 2.5 (i.e. its impact) can be assessed as follows:

Impact 317 / Criteria	high (4 points)	moderate (2 points)	low (1 point)
Causality between measure - objective	direct	indirect	-
Effectiveness range of the measure in the APSFR	area-wide	sub-regional	individual areas / properties*
Onset of effect	immediate	delayed	-
Persistence/continuity of the measure's effect	permanent	regular implementation required	one-off
Validity/binding force	legally binding	anchored in concepts	non-binding, voluntary implementation

Criterion 3: Maintain existing stationary and mobile defence structures

The implementation status of **LAWA measure 318** on maintaining stationary and mobile defence structures serves as an indicator of compliance with the criterion.

Definition according to the LAWA-BLANO catalogue of measures:

Maintain existing stationary and mobile defence structures. Carry out measures on structures such as dikes, flood walls and dunes, including extensive maintenance work above and beyond regular basic servicing; identify congestion points and provide backflow protection and inland drainage (e.g. via culverts, pumping stations, coarse screens, non-return valves); inspect and adapt structures to provide the necessary storm surge/flood protection (at barrages, dike openings, sluices and dike closures), especially in coastal areas. Prepare or optimise plans for watercourse maintenance and monitoring of water management facilities to ensure the proper functioning of flood defences and ensure that floodwater is discharged safely as per the rated capacity.

Regular maintenance measures are necessary to maintain the level of protection provided by existing stationary or mobile defence structures. Where there are changing environmental conditions (e.g. higher peak flows due to additional sealing, since defence structures facilitate more extensive human settlement), the design assumptions should be revised periodically. Regular checks and upgrades to the defence structures will improve flood control in protected areas and help to minimise flood-related damage.

Suitable concepts are drawn up and implemented the municipalities and associations. The spatial impact depends on the individual structure. Regular maintenance is essential.

In qualitative terms, this measure's contribution to the achievement of objective 2.5 (i.e. its impact) can be assessed as follows:

Impact 318 / Criteria	high (4 points)	moderate (2 points)	low (1 point)
Causality between measure - objective	direct	indirect	-
Effectiveness range of the measure in the APSFR	nationwide	sub-regional	individual areas / properties*
Onset of effect	immediate	delayed	-
Persistence/continuity of the measure's effect	permanent	regular implementation required	one-off
Validity/binding force	legally binding	anchored in concepts	non-binding, voluntary implementation

Objective 2.6: Reduce the potential for damage in flood-prone settlement areas by adapting / changing land use and by improving the modified handling of substances hazardous to water

Criterion 1: Reduce flood-sensitive uses in flood-prone areas

The implementation status of **LAWA measure 305** on the discontinuation or relocation of highly sensitive uses serves as an indicator of compliance with the criterion.

> *Definition according to the LAWA-BLANO catalogue of measures:*
>
> *Discontinue flood-sensitive uses or relocate them to areas with a lower probability of flooding. Take measures to eliminate/scale back flood-sensitive uses in flood-prone areas or relocate infrastructure to less flood-prone or lower-risk areas, resettle residents elsewhere and purchase / remove affected properties.*

Flood-sensitive uses may be relocated from flood-prone areas to safer areas. Examples might include relocating living quarters to higher storeys or even moving the entire building to less flood-prone areas, which largely eliminates the risk.

These measures are implemented voluntarily by public-sector or private owners. Their impact is limited to the property or plot in question. Once implemented, the effect is permanent.

In qualitative terms, this measure's contribution to the achievement of objective 2.6 (i.e. its impact) can be assessed as follows:

Impact 305 / Criteria	high (4 points)	moderate (2 points)	low (1 point)
Causality between measure - objective	direct	indirect	-
Effectiveness range of the measure in the APSFR	nationwide	sub-regional	individual areas / properties*
Onset of effect	immediate	delayed	-
Persistence/continuity of the measure's effect	permanent	regular implementation required	one-off
Validity/binding force	legally binding	anchored in concepts	non-binding, voluntary implementation
*Where a measure only affects an individual area or property, the impact on the APSFR as a whole will be relatively small. Evaluation of a LAWA measure may therefore suggest a moderate impact at best for such measures.			

Criterion 2: Boost flood defence measures in municipalities/households with substances hazardous to water

Implementing part of **LAWA measure 308**, specifically converting the energy supply from oil to gas and subsequently ensuring the flood-proof storage of heating tanks, improves flood defences and helps to minimise the associated risks.

> *Definition according to the LAWA-BLANO catalogue of measures:*
>
> *Flood-adapted handling of substances hazardous to water, such as converting the energy supply from oil to gas heating and ensuring the flood-proof storage of heating tanks.*

Unlike the indicator for objective 1.5, this indicator only covers measures relating to households or municipalities (i.e. excluding IED plants, Seveso III installations and AwSV facilities). The risk of oil leaks can be minimised by securing oil tanks, e.g. with float mechanisms or protected discharge lines. The primary effect of this measure is, firstly, to prevent major damage to the facility itself and, secondly, to prevent major water pollution. Relocating harmful substances to higher and flood-proof storeys can help to significantly reduce the associated risks.

The measures are implemented by public-sector or private owners and are legally binding under Section 78c of the Federal Water Act (WHG). These measures impact the individual facility or building immediately as soon as they are implemented.

In qualitative terms, this measure's contribution to the achievement of objective 2.6 (i.e. its impact) can be assessed as follows:

Impact 308 / Criteria	high (4 points)	moderate (2 points)	low (1 point)
Causality between measure - objective	direct	indirect	-
Effectiveness range of the measure in the APSFR	nationwide	sub-regional	individual areas / properties*
Onset of effect	immediate	delayed	-
Persistence/continuity of the measure's effect	permanent	regular implementation required	one-off
Validity/binding force	legally binding	anchored in concepts	non-binding, voluntary implementation
*Where a measure only affects an individual area or property, the impact on the APSFR as a whole will be relatively small. Evaluation of a LAWA measure may therefore suggest a moderate impact at best for such measures.			

Objective 2.7: Add further protective measures and create / improve the conditions for minimising existing risks

Criterion 1: Add further protective measures and/or improve the conceptual foundations for deriving suitable preventive measures/precautions to reduce the overall flood risk.

The implementation status of **LAWA measure 321**, particularly the drafting of local/regional flood control concepts, serves as an indicator of compliance with this criterion.

Definition according to the LAWA-BLANO catalogue of measures:

Add measures not previously described, such as flood control concepts.

Adding further protective measures and formulating local flood control concepts helps to lay the foundations for targeted protection and prevention measures and minimise the existing flood risks identified in the concept. These concepts are drafted voluntarily and on a one-off basis. They can lead to a direct improvement in the underlying conditions. Concepts are usually formulated for sub-areas, such as individual municipalities.

In qualitative terms, this measure's contribution to the achievement of objective 2.7 (i.e. its impact) can be assessed as follows:

Impact 321 / Criteria	high (4 points)	moderate (2 points)	low (1 point)
Causality between measure - objective	direct	indirect	-
Effectiveness range of the measure in the APSFR	nationwide	sub-regional	individual areas / properties*
Onset of effect	immediate	delayed	-
Persistence/continuity of the measure's effect	permanent	regular implementation required	one-off
Validity/binding force	legally binding	anchored in concepts	non-binding, voluntary implementation

5.3 Overarching objective 3: Reduce adverse consequences during a flood

The third overarching objective is to take suitable precautions to enable prompt, targeted actions for minimising adverse consequences. Such precautions must be taken in advance of possible flooding, and the actions take effect in the event of a flood.

Table 13: Overview of objectives and criteria for the achievement of overarching objective 3

Obj. no.	Overarching objective 3: Reduce adverse consequences during a flood	Criteria for achieving the objective
3.1	Provide and improve forecasting of storm surges, floods and water levels	Criterion: Improve the flood warning service and storm surge forecasting capacity Criterion: Improve municipal alert and information systems
3.2	Improve crisis management by means of alert and operational planning	Criterion: Improve alert and operational planning at municipality level and among the responsible authorities
3.3	Educate affected residents and companies about flood risks and how to behave in the event of flooding	Criterion: Raise awareness among the general public and companies

Objective 3.1: Provide and improve forecasting of storm surges, floods and water levels

Criterion 1: Improve the flood warning service and storm surge forecasting capacity

The implementation status of **LAWA measure 322** on establishing and improving flood warning services and storm surge forecasting serves as an indicator of compliance with the criterion.

Definition according to the LAWA-BLANO catalogue of measures:

Establish or improve flood warning services and storm surge forecasting. Create appropriate organisational and technical capacity for flood forecasting and warning; improve the availability of current hydrological measurement data (precipitation and discharge data), optimise the measurement network, minimise susceptibility to failures, optimise reporting channels.

Reliable flood forecasting in at-risk areas is essential for ensuring that affected residents and authorities are promptly notified. The existence and optimisation of warning services and forecasts, e.g. by optimising data management, ensures a supply of up-to-date and reliable information on precipitation and runoff in case of a flood. Additional, high-quality information on water levels, flow rates and precipitation is vital for the disaster control agencies as well as the general public, enabling them to take appropriate, timely precautions and control measures to minimise the adverse consequences of flooding.

The competent water authorities use suitable concepts to implement this measure. They have an area-wide effect in the forecasting region, as well as an indirect effect by informing affected individuals to help them take suitable precautions.

In qualitative terms, this measure's contribution to the achievement of objective 3.1 (i.e. its impact) can be assessed as follows:

Impact 322 / Criteria	high (4 points)	moderate (2 points)	low (1 point)
Causality between measure - objective	direct	indirect	-
Effectiveness range of the measure in the APSFR	area-wide	sub-regional	individual areas / properties*
Onset of effect	immediate	delayed	-
Persistence/continuity of the measure's effect	permanent	regular implementation required	one-off
Validity/binding force	legally binding	anchored in concepts	non-binding, voluntary implementation

Criterion 2: Improve municipal alert and information systems

The implementation status of **LAWA measure 323** on establishing and improving municipal alert and information systems serves as an indicator of compliance with the criterion.

Definition according to the LAWA-BLANO catalogue of measures:

Establish or improve municipal alert and information systems e.g. by using Internet-based local information systems, developing special software etc., and taking measures to ensure local flood warnings for the general public (such as a siren system).

A well-developed early warning network with optimised communication channels and regularly reviewed alarm levels and alert services allows authorities to respond swiftly in the event of flooding. By promptly notifying the competent authorities and affected residents

about water levels and precipitation volumes, they can take appropriate, timely precautions and defence actions to minimise the adverse consequences of flooding.

The competent water boards and municipalities implement this measure voluntarily. It has a targeted effect in the area covered by the warning system as well as an indirect effect by notifying affected individuals to help them take suitable precautions.

In qualitative terms, this measure's contribution to the achievement of objective 3.1 (i.e. its impact) can be assessed as follows:

Impact 323 / Criteria	high (4 points)	moderate (2 points)	low (1 point)
Causality between measure - objective	direct	indirect	-
Effectiveness range of the measure in the APSFR	area-wide	sub-regional	individual areas / properties*
Onset of effect	immediate	delayed	-
Persistence/continuity of the measure's effect	permanent	regular implementation required	one-off
Validity/binding force	legally binding	anchored in concepts	non-binding, voluntary implementation

Objective 3.2: Improve crisis management by means of alert and operational planning

Criterion: Improve alert and operational planning among municipalities and the responsible authorities

The implementation status of **LAWA measure 324** on planning and optimising crisis and resource management serves as an indicator of compliance with the criterion.

> *Definition according to the LAWA-BLANO catalogue of measures:*
>
> *Plan and optimise crisis and resource management. Establish or optimise crisis management planning including alert and operational planning, make essential personnel and material resources available (e.g. by warehousing flood control materials or increasing the number of flood defence units), establish/optimise weir, dike and other groups, conduct regular drills and training for the emergency services.*

Improving alert and operational planning helps to ensure that the authorities and rescue services are better prepared to tackle floods, which in turn helps to minimise damage. Damage to persons and property can only be effectively prevented with adequate resources, regular drills and appropriate operational planning. Regular drills in particular enable a swift, targeted response to protect residents and property.

At municipality level, these measures are implemented by the fire brigades in cooperation with the security services and police and tend to be legally binding as governed by disaster

control legislation. Provided they are implemented in full, including regular drills, these measures will have a direct, area-wide effect.

In qualitative terms, this measure's contribution to the achievement of objective 3.2 (i.e. its impact) can be assessed as follows:

Impact 324 / Criteria	high (4 points)	moderate (2 points)	low (1 point)
Causality between measure - objective	direct	indirect	-
Effectiveness range of the measure in the APSFR	Area-wide	sub-regional	individual areas / properties*
Onset of effect	immediate	delayed	-
Persistence/continuity of the measure's effect	permanent	regular implementation required	one-off
Validity/binding force	legally binding	anchored in concepts	non-binding, voluntary implementation

NOTE: The criterion may be further developed to help measure the achievement of objectives by including the proportion of measures already implemented in the APSFR. If all municipalities in a given region have prepared suitable alert and operational plans and hold regular drills, the objective has been 100% met. The number of measures actually implemented must be compared against the theoretical total number of measures (municipalities) in the river basin district.

Objective 3.3: Educate affected residents and companies about flood risks and how to behave in the event of flooding

Criterion: Improve awareness among residents and companies

The implementation status of **LAWA measure 325** on behavioural precautions serves as an indicator of compliance with the criterion.

> *Definition according to the LAWA-BLANO catalogue of measures:*
>
> *Behavioural precautions, APSFR-specific measures to educate the general public about flood risks and how to prepare for them, e.g. by preparing and publishing hazard and risk maps; local information via the media (flood markers, educational flood trails, etc.), publication of information materials.*

By providing and proactively sharing information about the nature and extent of the flood risk, the general public and businesses will understand how to behave in the event of flooding. This knowledge will help minimize damage to property and ensure that human lives are not put at risk. Since the impacts of flood information campaigns tend to be comparatively short-lived (so-called "flood amnesia"), they must be repeated regularly.

The measures are implemented voluntarily by the municipalities. Information campaigns explaining behavioural precautions have an area-wide impact. Supplying affected individuals with information to help them modify their behaviour in the event of flooding has an indirect effect.

In qualitative terms, this measure's contribution to the achievement of objective 3.3 (i.e. its impact) can be assessed as follows:

Impact 325 / Criteria	high (4 points)	moderate (2 points)	low (1 point)
Causality between measure - objective	direct	indirect	-
Effectiveness range of the measure in the APSFR	area-wide	sub-regional	individual areas / properties*
Onset of effect	immediate	delayed	-
Persistence/continuity of the measure's effect	permanent	regular implementation necessary	one-off
Validity/binding force	legally binding	anchored in concepts	non-binding, voluntary implementation

5.4 Overarching objective 4: Reduce adverse consequences following a flood

The fourth overarching objective also addresses essential flood preparations whose impact is not felt until later. These are aftercare measures designed to enable a fast response to the damage and other consequences associated with flooding.

Table 14: Overview of objectives and criteria for the achievement of overarching objective 4

Obj. no.	Overarching objective 4: Reduce adverse consequences following a flood	Criteria for achieving the objective
4.1	Improve the preparation and provision of emergency aid	Criterion: Improve emergency aftercare and support of affected individuals
4.2	Improve the preparation and implementation of environmental damage repairs	Criterion: Improve remedial action to repair environmental damage
4.3	Improve the preparation and implementation of incident and damage rectification	Criterion: Improve the preparation of incident and damage documentation
4.4	Improve provisioning for financial losses	Criterion: Improve the availability of information for owners about financial risk provisioning

Objective 4.1: Improve the preparation and provision of emergency aid

Criterion: Improve emergency aftercare and support of affected individuals

The implementation status of **LAWA measure 327** on damage after-care is used as an indicator of compliance with the criterion.

> *Definition according to the LAWA-BLANO catalogue of measures:*
>
> *Damage after-care: Plan and prepare measures to resume operation as quickly as possible, provide financial assistance and make preparations for acute medical aftercare, such as emergency facilities and healthcare personnel etc.; incorporate aftercare into crisis management planning.*

This only concerns measures aimed at providing emergency aid to affected individuals and companies. They are usually incorporated into crisis management planning at municipality level. Where necessary, planning may include the deployment of technical aid organisations.

Early planning and measures to ensure the prompt delivery of emergency aid improves our capacity to respond to floods. Direct assistance can be made available immediately, helping to minimize consequential damages and health impacts.

The measures are implemented voluntarily by the municipalities and benefit individual population groups or companies. Implementing this measure directly contributes to the objective of minimizing adverse consequences after flooding. However, the one-off effects occur once only with a time delay, since preparations are made in advance, while actual implementation (and hence the effect) occurs after the event.

In qualitative terms, this measure's contribution to the achievement of objective 4.1 (i.e. its impact) can be assessed as follows:

Impact 327 / Criteria	high (4 points)	moderate (2 points)	low (1 point)
Causality between measure - objective	direct	indirect	-
Effectiveness range of the measure in the APSFR	area-wide	sub-regional	individual areas / properties*
Onset of effect	immediate	delayed	-
Persistence/continuity of the measure's effect	permanent	regular implementation required	one-off
Validity/binding force	legally binding	anchored in concepts	non-binding, voluntary implementation

Objective 4.2: Improve the preparation and implementation of environmental damage repairs

Criterion: Improve remedial action to repair environmental damage

The implementation status of **LAWA measure 327** on damage after-care serves as an indicator of compliance with the criterion.

> *Definition according to the LAWA-BLANO catalogue of measures:*
>
> *Damage after-care: Plan and prepare measures to remove waste, repair environmental damage etc., especially remedial action for agriculture/forestry and industrial emissions as defined in IED Directive 2010/75/EU in order to prevent further damage.*

This only refers to remedial measures to repair environmental damage in the agriculture/forestry sectors.

Early planning and preparation of measures to repair environmental damage after a flood enables the relevant agencies to respond swiftly to hazardous situations to help contain and minimize the spread of damage to the environment. Suitable remedial action in the agriculture and forestry sectors can help prevent consequential damages, e.g. associated with the use of unsafe foods.

The measures are implemented voluntarily by the owners for their own benefit. There is a direct, one-off effect which occurs with a delay, since preparations are made in advance but not implemented (i.e. they do not take effect) until after a flood.

The measures are implemented by the farmers/forest managers or businesses concerned.

In qualitative terms, this measure's contribution to the achievement of objective 4.2 (i.e. its impact) can be assessed as follows:

Impact 327 / Criteria	high (4 points)	moderate (2 points)	low (1 point)
Causality between measure - objective	direct	indirect	-
Effectiveness range of the measure in the APSFR	area-wide	sub-regional	individual areas / properties*
Onset of effect	immediate	delayed	-
Persistence/continuity of the measure's effect	permanent	regular implementation required	one-off
Validity/binding force	legally binding	anchored in concepts	non-binding, voluntary implementation

Objective 4.3: Improve the preparation and implementation of incident and damage documentation

Criterion: Improve the preparation of incident and damage documentation

The implementation status of **LAWA measure 328** on behavioural precautions serves as an indicator of compliance with the criterion.

Definition according to the LAWA-BLANO catalogue of measures:

Other restoration, regeneration and review measures: Other restoration, regeneration and review measures not listed under or assignable to previous descriptions.

Conscientiously documenting the experiences gained from a flood, ideally in a cross-sectional database, creates a consistent information chain about the development and effects of the flood. This allows those responsible to review, validate and optimise flood risk management, and in the long term, minimise the adverse consequences associated with floods.

The measures are implemented voluntarily by the responsible water authorities, municipalities, associations, disaster control agencies and other stakeholders.

In qualitative terms, this measure's contribution to the achievement of objective 4.3 (i.e. its impact) can be assessed as follows:

Impact 328 / Criteria	high (4 points)	moderate (2 points)	low (1 point)
Causality between measure - objective	direct	indirect	-
Effectiveness range of the measure in the APSFR	area-wide	sub-regional	individual areas / properties*
Onset of effect	immediate	delayed	-
Persistence/continuity of the measure's effect	permanent	regular implementation required	one-off
Validity/binding force	legally binding	anchored in concepts	non-binding, voluntary implementation

Objective 4.4: Improve provisioning for financial losses

Criterion: Improve the availability of information for owners about financial risk provisioning

The implementation status of **LAWA measure 326** on risk provisioning serves as an indicator of compliance with the criterion.

Definition according to the LAWA-BLANO catalogue of measures:

Risk provisioning: e.g. insurance policies, personal financial provisioning, creation of reserves.

By providing information on the options available to affected citizens to protect themselves financially against flood-related damage, including insurance policies, municipalities can help to minimise the adverse consequences of floods. Affected citizens/owners are informed about the individual options available.

The measures are implemented voluntarily by the municipalities and owners. Their effect is indirect and occurs with a time delay. Information must be repeated regularly in order to be effective.

In qualitative terms, this measure's contribution to the achievement of objective 4.4 (i.e. its impact) can be assessed as follows:

Impact 326 / Criteria	high (4 points)	moderate (2 points)	low (1 point)
Causality between measure - objective	direct	indirect	-
Effectiveness range of the measure in the APSFR	nationwide	sub-regional	individual areas / properties*
Onset of effect	immediate	delayed	-
Persistence/continuity of the measure's effect	permanent	regular implementation required	one-off
Validity/binding force	legally binding	anchored in concepts	non-binding, voluntary implementation
*Where a measure only affects an individual area or property, the impact on the APSFR as a whole will be relatively small. Evaluation of a LAWA measure may therefore suggest a moderate impact at best for such measures.			

6 Text modules for documenting the results

The same scheme applies when documenting the progress made in each overarching objective:

Table 15: Text modules documenting overall progress towards overarching objective (OO) 1

<table>
<tr><th>Overarching objective X
[No. of OO]</th><th>[Selection by overall result]</th><th>[Selection by individual result of the objectives]</th><th>[Selection of targets each with identical progress]</th></tr>
<tr><td rowspan="6">For [text of overarching objective] in the period [2015-2021], overall ..</td><td>no or very little ..</td><td rowspan="6">=> for significant and major progress
1. In particular, measures to achieve the following objectives were implemented on a large scale: [List of relevant objectives, see right-hand column]

=> for moderate and minimal progress
2. Identifiable progress has been made towards the following objectives: [List of relevant objectives, see right-hand column]

=> for no or very little progress
3. In future, efforts must be stepped up with regard to the following objectives: [List of relevant objectives, see right-hand column]</td><td>Improve land precautions by incorporating flood risks into spatial and sectoral planning</td></tr>
<tr><td>minimal ...</td><td>Protect land to prevent new risks and conserve water retention within spatial planning</td></tr>
<tr><td>moderate ....</td><td>Increase the ratio of flood-adapted (land) use</td></tr>
<tr><td>significant ...</td><td>Improve building precautions for new buildings and renovations (flood-adapted construction methods)</td></tr>
<tr><td>major ...</td><td rowspan="2">Improve flood-adapted handling (storage, processing) of substances hazardous to water</td></tr>
<tr><td>... progress has been made.</td></tr>
<tr><td colspan="4">red font: parameters to be selected
blue font: predefined texts (e.g. text about the overarching objective; corresponding text about the chosen degree of progress)</td></tr>
</table>

6.1 Overarching objective 1: Prevent new risks (before a flood) in the flood risk area

The following text modules provide a detailed description of significant and major progress achieved towards overarching objective (OO) 1:

Table 16: Selection of text modules for objectives with significant and major progress explaining their impact on the achievement of overarching objective 1

Description of progress towards OO 1:	**[Selection of objectives with significant/major progress]**		**[Text module depending on the chosen objective]:**
Significant or major progress has been made with the following objectives: [Select according to evaluation result in list form]	Improve land precautions by incorporating flood risks into spatial and sectoral planning	In conclusion, the following improvements have been achieved: [Automatic assignment to the corresponding objective]	Flood risks are adequately considered in spatial planning, enabling new risks to be avoided. The retention function of the relevant areas is documented in the plans. Development planning requirements prohibit or restrict building in at-risk areas. Implementing these measures prevents or controls the occurrence of new risks.
	Protect land to prevent new risks and conserve/protect water retention within spatial planning		Settlement activity in these areas has been significantly restricted, and the construction of new buildings is generally prohibited. This prevents an increase in new risks (settlements, infrastructure) and precludes the further loss of retention area, which in turn minimises the future risks associated with intensified runoff below. Overall, minimising the potential damage associated with floods achieves positive effects.
	Increase the ratio of flood-adapted (land) use		Increased adaptation of land use prevents additional damage potential on affected land or limits it to a reasonable amount.
	Improve building precautions for new buildings and renovations (flood-adapted construction methods)		New risks associated with increased flood damage potential are avoided. Local damage to property and infrastructure facilities is minimised thanks to flood-adapted land use, elevating parts of buildings and fitting water- and pressure-tight windows at flood level.
	Improve flood-adapted handling (storage, processing) of substances hazardous to water		The increased risk of significant water pollution from IED plants, Seveso III facilities and AwSV installations is prevented. This does not cover private households or municipalities.
red font: parameters to be selected blue font: specified texts (selection of the objective and corresponding impact text)			

6.2 Overarching objective 2: Reduce existing risks (before a flood) in the risk area

The following text modules provide a detailed description of significant and major progress achieved towards overarching objective 2:

Table 17: Selection of text modules for objectives with significantand major progress to describe the impacts on achievement of overarching objective (OO) 2

Description of progress towards OO 2:	**[Selection of objectives with significant/major progress]**		**[Text module depending on the chosen objective]:**
Significant or major progress has been made with the following objectives: [Select according to evaluation result in list form]	Improve/increase natural water retention	In conclusion, the following improvements have been achieved: [Automatic assignment to the corresponding objective]	The water storage potential of the affected soils has been increased. Natural water retention in the area was also improved by restoring natural retention areas, e.g. by relocating or removing dikes and walls that are no longer required or by renaturing water bodies. Runoff-minimising land management in agriculture and forestry was also improved, helping to dampen peak flows and reduce the potential for erosion and damage.
	Improve water retention in settlement areas (handling of precipitation water)		Rainwater is directly infiltrated or stored in settlement areas and retained, helping to reduce or balance out flood runoff peaks and promote natural water cycle processes.
	Improve the discharge capacity in at-risk areas		Drain cross-sections were enlarged and obstacles removed to more effectively prevent rivers bursting their banks. This has reduced the flood risk in the at-risk area.
	Reduce/restrict flood discharges		Flood retention areas and dams reduce and delay discharge in a controlled manner to selectively minimise the flood risk in sensitive areas, supported by regular maintenance and improvement of flood retention areas and dams.
	Improve flood protection including structural precautions to existing buildings		Potentially affected areas were protected from flooding by the construction or expansion of stationary flood defences up to a specified rated capacity, thereby reducing the risk of damage. The risk of direct damage to potentially affected properties (buildings, infrastructure) has been reduced by supplementary mobile flood defences or structural precautions
	Reduce the potential for damage in flood-prone settlement areas by adapting and changing land use and by improving the modified handling of substances hazardous to water		Flood-sensitive or environmentally hazardous uses have been relocated from flood-prone areas to safer areas (e.g. to higher storeys). For example, the risk of flood-related environmental damage has been reduced by switching the energy supply from oil to gas or retrospectively protecting heater tanks against flood damage.
	Add further protective measures and create/improve the conditions for reducing existing risks		Existing flood risks have been minimised by means of targeted additional protective measures. Flood protection plans and precautionary concepts have been drawn up. Further targeted measures to reduce the existing flood risk may be planned and implemented in future.
red font: parameters to be selected blue font: specified texts (selection of the objective and corresponding impact text)			

6.3 Overarching objective 3: Reduce adverse consequences during a flood

The following text modules provide a detailed description of significant and major progress achieved towards overarching objective 3:

Table 18: Selection of text modules for objectives with significant and major progress to describe the impacts on the achievement of overarching objective (OO) 3

Description of progress towards OO 3:	**[Selection of objectives with significant/major progress]**		**[Text module depending on the chosen objective]:**
Significant or major progress has been made with the following objectives: [Select according to evaluation result in list form]	Provide and improve forecasting of storm surges, floods and water levels	In conclusion, the following improvements have been achieved: [Automatic assignment to the corresponding objective]	In the event of flooding, the disaster control authorities and affected residents have access to reliable information, enabling them to take prompt, appropriate protective measures and precautions. The water authorities have improved the flood alert service, flood forecasting and storm surge forecasting capacity to help minimise adverse impacts. Establishing and improving municipal warning and information systems helps to shorten the official response times to flooding and facilitate the prompt initiation of protective measures and precautions.
	Improve crisis management by means of alert and operational planning		The authorities and emergency services are better prepared for floods, which in turn helps to prevent or minimise injuries and material damage.
	Educated affected residents and companies about flood risks and correct conduct in the event of an incident		Potentially affected individuals and companies know how to behave in the event of a flood and are equipped to make the necessary decisions to minimise damage to property and danger to life. Since information campaigns on flood risks have a comparatively short-lived impact (flood amnesia), they must be repeated at short intervals wherever possible.
red font: parameters to be selected blue font: specified texts (selection of the objective and corresponding impact text)			

6.4 Overarching objective 4: Reduce adverse consequences following a flood

The following text modules provide a detailed description of significant and major progress towards overarching objective 4:

Table 19: Selection of text modules for objectives with significant and major progress to describe the impacts on achievement of overarching objective (OO) 4

Description of progress towards OO 4:	**[Selection of targets with significant/major progress]**		**[Text module depending on the selected objective]:**
Significant or major progress has been made with the following objectives: [Select according to evaluation result in list form]	Improve the preparation and provision of emergency aid	In conclusion, the following improvements have been achieved: [Automatic assignment to the corresponding objective]	Emergency aid can be provided quickly and directly to individuals and companies affected by flooding (e.g. emergency healthcare, psychological support, assistance with resuming operations). This in turn helps to minimise consequential damage, including health-related impacts.
	Improve the preparation and implementation of environmental damage repairs		All forms of waste are promptly disposed of in an environmentally friendly manner and environmental damage repairs are carried out. This also helps to prevent potential hazards - such as the use of agricultural products contaminated by flood damage.
	Improve the preparation and implementation of incident and damage rectification		A consistent information chain covering the development and impacts of the flood ensures accurate documentation of floods. This ensures that FRM measures are regularly reviewed, validated and optimised.
	Improve provisioning for financial losses		Affected residents and companies are familiar with and use insurance to protect themselves from flood-related damage. Individual/private provisioning for financial losses is in place.
red font: parameters to be selected blue font: specified texts (selection of the objective and corresponding impact text)			

7 Underlying theories for the methodology

7.1 Tools and objectives

"The problem with discussing objectives is that objectives can also be interpreted as tools, and vice versa" (Brösse 1994, 508). Designating priority flood prevention areas may be the defined objective of flood risk management, but it also serves as a means of protecting potentially endangered settlements or safeguarding retention areas. "The only way out of this dilemma is to view it from the perspective of either the person requesting it or the person implementing it. Viewed in this way, an objective is the aspired state, while a tool describes the means of achieving that state" (Brösse 1994, p. 508).

For the purposes of the methodology described here, this is particularly evident in the case of overarching objectives 3 and 4 (some of the objectives and criteria/measures have almost identical wording, see chapter 3).

7.2 Impact analysis

"Theories about causal relationships claim to provide generally valid insights into the effects of the tools [/measures] investigated" (Brösse 1994, p. 510). Generally speaking, however, relevant theories tend only to link together a handful of variables and are based on simplistic assumptions about framework conditions. "However, this is not applicable to typical problem areas [in spatial development]. As such, theory-based impact predictions can only claim universal validity under highly restrictive conditions and serve merely to make the impacts plausible" (Brösse 1994, p. 510).

"The effects of a tool/measure often depend on its subsequent use elsewhere, or on the use of other tools or measures" (Brösse 1994, p. 510). The impacts of different approaches to FRM may weaken or even cancel one other out. Given their highly complex nature and the lack of readily available data, the methodology used here does not cover such potential interdependencies.

It is not the intention of this study to assess the specific effects of individual measures, since the individual LAWA measures are grouped together and aggregated to facilitate reporting on each APSFR. At this level, the appropriate approach is to summarise and document the impacts of LAWA measures using heory-based forecasts.

7.3 Approaches to success monitoring

Our task is to gauge the progress made towards achieving objectives, which is a form of success monitoring. Essentially, there are three main types of success monitoring (Mäding 1994, p. 226):

- Enforcement monitoring is descriptive and gauges whether the scheduled measures have been implemented according to plan. It also scrutinises any deviations, which are not necessarily a bad thing, because the ability to adapt flexibly to new situations is in fact a desirable trait.

  The present concept proposes enforcement monitoring based on the status of implementation (STATUS) of LAWA measures, as derived from EU reporting (chapter 4.1).

- Impact monitoring is based on causal analysis and uses theories and observations to identify the effects of the measures. The theoretical impacts described indicate the basic direction of any impacts and can therefore be used to define a measure's contribution to the achievement of objectives. However, their complexity means that only limited consideration can be given to the consequences and interactions.

  The present concept describes the chain of effects created by LAWA measures and evaluates their effect on the achievement of objectives according to defined criteria (Chapter 4.1).

- Target achievement monitoring compares the actual situation with a previously operationalised target scenario. The heterogeneous nature of the information means it is often difficult to integrate individual results from different regions, (implementation) strategies and periods into a single overall assessment.

  Our methodology is designed to measure progress towards achievement of the objectives, rather than achievement of the objectives *per se*. There is a lack of consensus on the aspired target status, and as a result, we have opted not to monitor target achievement at present. Where conceivable approaches exist for monitoring the achievement of objectives, this is indicated under the relevant criterion. If it becomes necessary to assess the achievement of objectives at a later date, the target statuses relating to FRM objectives will need to be defined.

8 Bibliography

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