

**NWRM - Natural Water Retention Measures
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Session 4 · NWRM as a catalyst for policy co-ordination

**NWRMs in Cyprus
Past – present – future**



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Contents – Topics

- Cyprus' water environment (complementing presentations of workshop #1)
- NWRMs implemented in the *past* in Cyprus
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- Some comments, suggestions & questions for the NWRM project



Cyprus' water environment

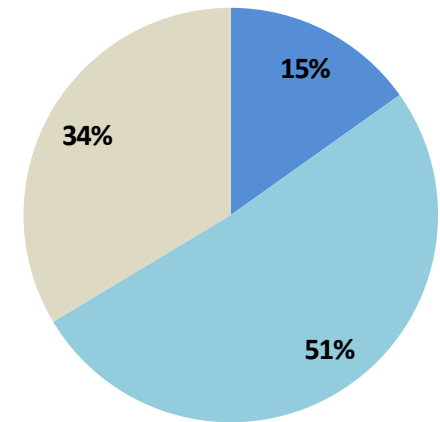
- **Rivers**

- Total WFD network length: approx. 2600km
- About 370km perennial
- About 1250km intermittent
- About 820km ephemeral/episodic
- 160km not accessible to the Republic of Cyprus

- **Lakes**

- Four natural lake systems
- All lake systems are small, lowland-coastal, with brackish or salty water
- **> 100 water reservoirs**
- There are dams on all major rivers

River regime types in Cyprus
(% of WFD river network length)



- Perennial
- Intermittent
- Ephemeral/episodic



NWRMs in Cyprus – the past (1)

- Traditional terracing, widespread in mountainous Cyprus (but being abandoned nowadays) (NWRM: A10)
- Retention (flood storage) reservoirs on temporary rivers for artificial-managed aquifer recharge (NWRM: N1, N13)
- Wetland & lake restoration, related to Cyprus' shallow natural lakes (NWRM: N2, N12)
- Detention trenches in alluvial riverbeds for artificial-managed aquifer recharge (NWRM: N13)
- SuDS in Limassol urban area (cf. presentation of I. Papaïacovou in 1st Med-NWRM workshop; various urban NWRMs)



NWRMs in Cyprus – the past (2)

- Afforestation on artificial terraces in headwater areas (NWRM: F2)
- Continuous cover forestry; common practice in Cyprus. (NWRM: F6)
- Ditch blocking & small check dams as support to reforestation efforts (NWRM: F9, F13)

→ Most of the measures are responses to the dry climate and the water scarcity of Cyprus

→ Measures are usually NOT aimed at restoring or maintaining aquatic ecosystems



Traditional terracing



Near Alona, Pitsilia area



Retention reservoir

Gabion weir #3
on Peristerona River

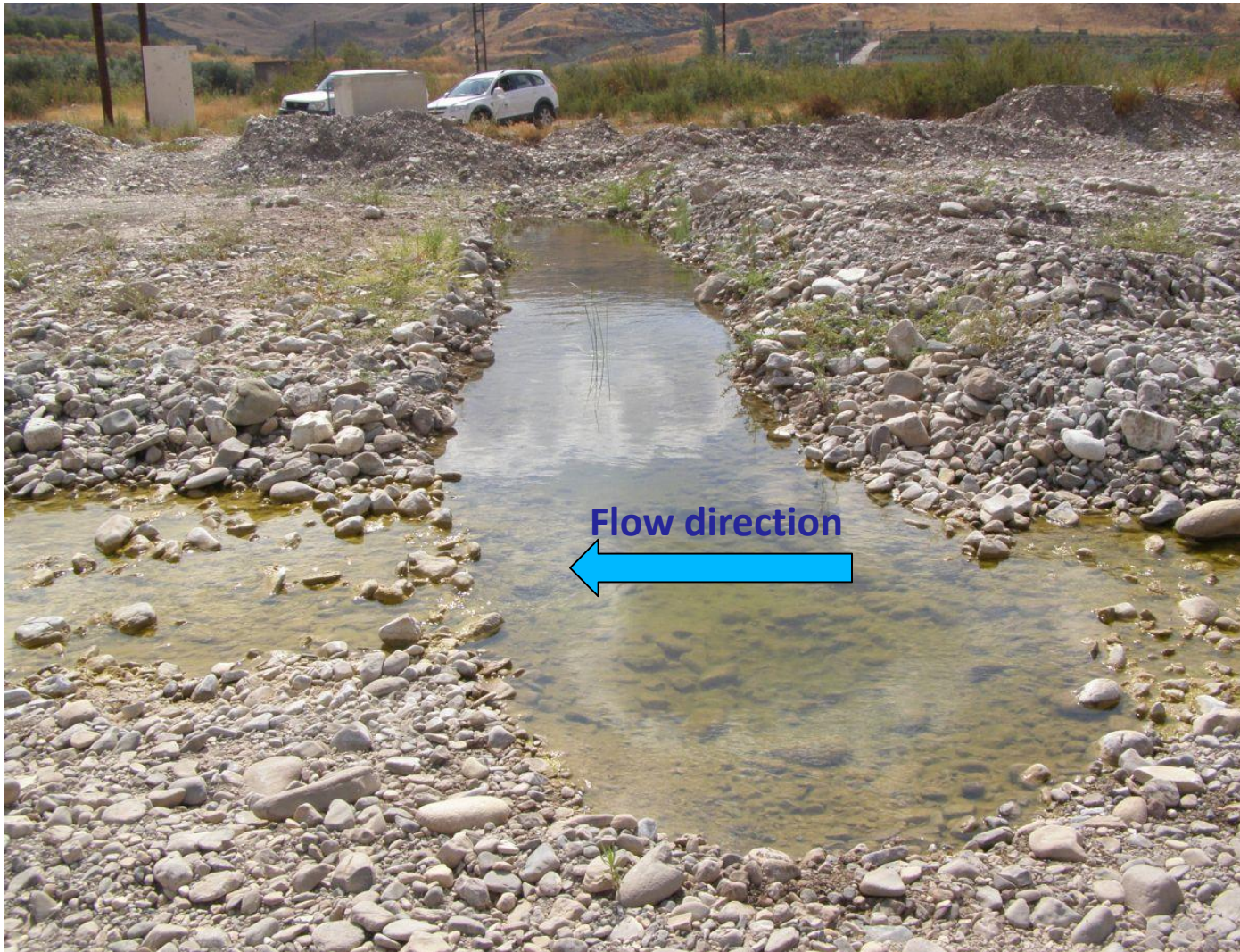


Retention reservoir

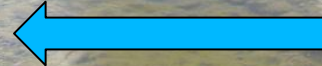
Gabion weir #3 on Peristerona River
(retention basin u/s weir)



Detention trenches in alluvial riverbeds



Flow direction



Xeropotamos River (Paphos)



Detention trenches in alluvial riverbeds



Xeropotamos River (Paphos)



[...same river...a bit more flow...]



Xeropotamos River (Paphos)



Afforestation on artificial terraces & ditch blocking/low terraces for agriculture

Koshi area
(next to
Nicosia –
Larnaca
motorway)



Afforestation on artificial terraces

ditch blocking /
low terraces

0 0.05 0.1 0.2 0.3 0.4 0.5 Kilometers



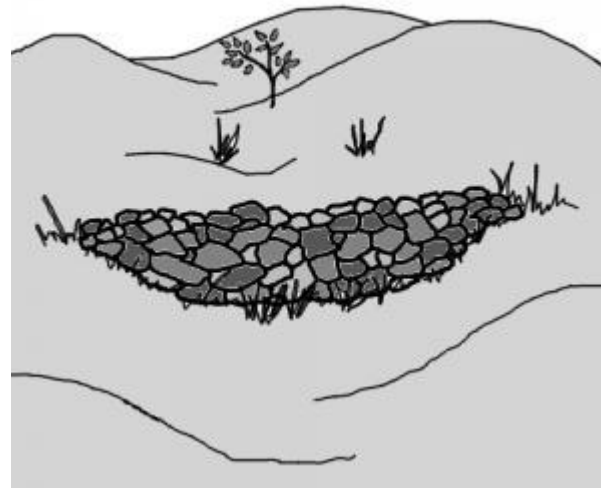
Afforestation on artificial terraces & ditch blocking/low terraces for agriculture

Koshi area
(next to
Nicosia –
Larnaca
motorway)



Ditch blocking & small check dams as support to reforestation efforts

Common practice introduced with the reforestation efforts under British colonial rule. Check dams are still visible all over Troodos mountains.



Source: www.sswm.info



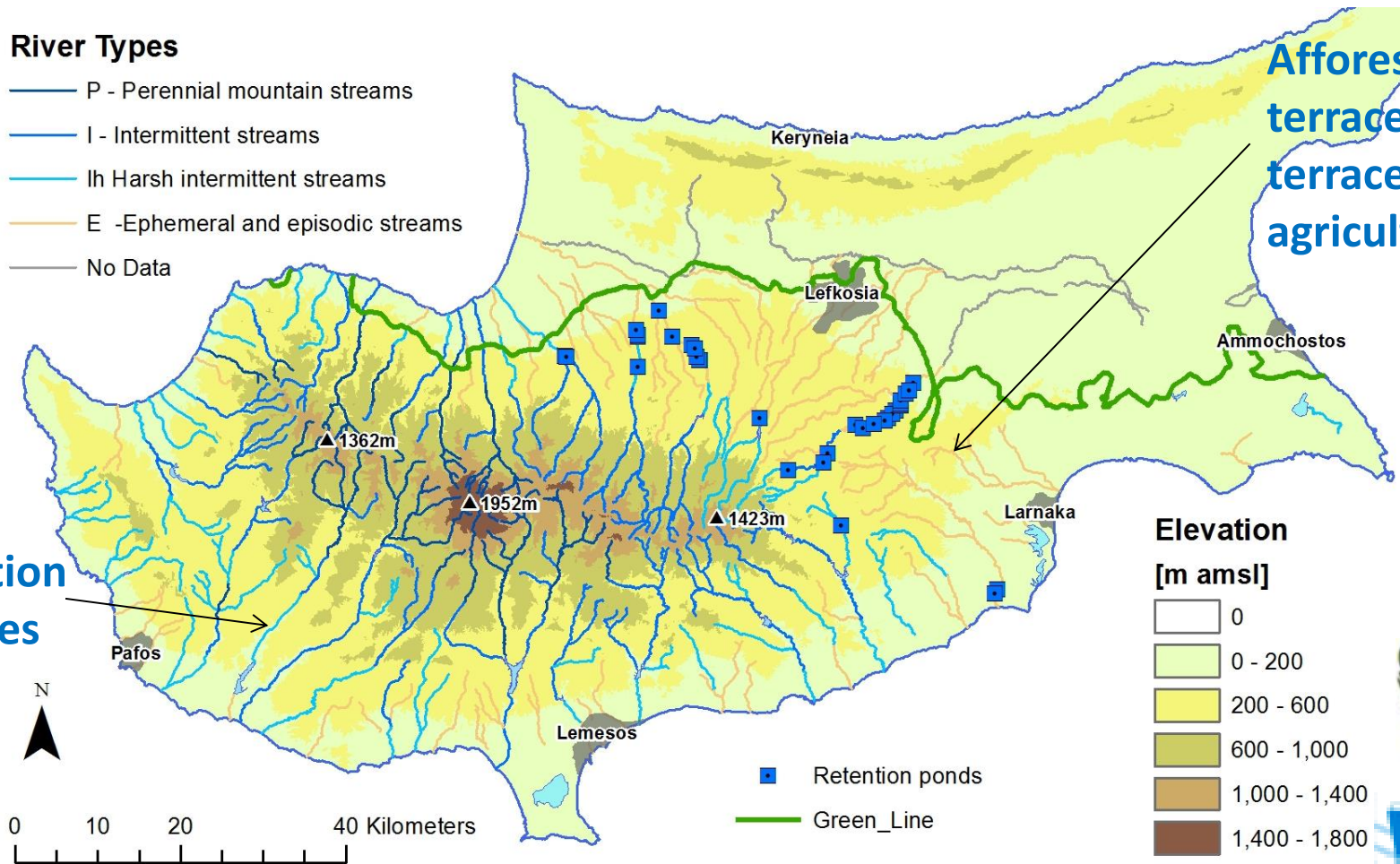
Location of measures

River Types

- P - Perennial mountain streams
- I - Intermittent streams
- Ih Harsh intermittent streams
- E -Ephemeral and episodic streams
- No Data

Afforestation
terraces & low
terraces for
agriculture

Detention
trenches



Elevation [m amsl]

- 0
- 0 - 200
- 200 - 600
- 600 - 1,000
- 1,000 - 1,400
- 1,400 - 1,800

- Retention ponds
- Green_Line



NWRMs in Cyprus' RBMP #1 – the present

Approach:

- ❖ Review of measures included in the PoM
- ❖ Identification of measures that (may) have a water retention component
- ❖ Analysis of the identified NWRM-related measures for:
 - Recognition of water retention component
 - Benefits – recognized and missed
 - Involved bodies – coordination, participation gaps

Results:

- ❖ Insights in degree of recognition of NWRMs – and gaps
- ❖ Identification of priority areas for future action



Measure	#5 - Prohibition of gravel extraction from river beds, especially in rivers Diarizos, Xeros and Ezousa (SPAs)
Water retention mechanism(s)	Slow river water, store river water
Targeted policy objectives (mentioned in PoM)	Birds Directive 79/409/EC
<i>Other potentially applicable policy objectives</i>	<i>WFD , FD</i>
Implementing bodies (mentioned in PoM)	WDD, Game & Fauna Service
<i>Other potentially involved bodies</i>	<i>Local community (?)</i>
Benefits (mentioned in PoM)	Improve habitats for Birds Dir. 79/409/EC
<i>Other potential benefits</i>	<i>Water Storage; erosion/sediment control; flood risk reduction; aesthetic/cultural value</i>

Measure	#31 - Strengthen the provisions aimed at safeguarding riparian areas in regional development plans
Water retention mechanism(s)	-
Targeted policy objectives (mentioned in PoM)	Floods Directive 2007/60/EC
<i>Other potentially applicable policy objectives</i>	<i>WFD , Birds Dir., Habitats Dir.</i>
Implementing bodies (mentioned in PoM)	WDD, Town Planning and Housing Department, Ministry of Interior
<i>Other potentially involved bodies</i>	<i>Environment Dept., Game & Fauna Service</i>
Benefits (mentioned in PoM)	Improve riparian areas for Floods Directive 2007/60/EC
<i>Other potential benefits</i>	<i>Benefits for WFD , Birds Dir., Habitats Dir.</i>

Measure	#33 - Implementation and updating of guidelines for the design and management of riparian areas in flood areas
Water retention mechanism(s)	Slow river water, store river water
Targeted policy objectives (mentioned in PoM)	Floods Directive 2007/60/EC
<i>Other potentially applicable policy objectives</i>	<i>WFD , Birds Dir., Habitats Dir.</i>
Implementing bodies (mentioned in PoM)	WDD
<i>Other potentially involved bodies</i>	<i>Environment Dept., Game & Fauna Service</i>
Benefits (mentioned in PoM)	Improve riparian areas & flood attenuation for Floods Directive 2007/60/EC
<i>Other potential benefits</i>	<i>Benefits for WFD , Birds Dir., Habitats Dir.</i>

Measure	#47 – Preparation of a framework for a uniform policy for sustainable management of stormwater
Water retention mechanism(s)	Store/slow runoff; increased infiltration / recharge;
Targeted policy objectives (mentioned in PoM)	Floods Directive 2007/60/EC Birds Dir., Habitats Dir., WFD (quant. status)
<i>Other potentially applicable policy objectives</i>	-
Implementing bodies (mentioned in PoM)	WDD, Town Planning and Housing Department, Ministry of Interior, Geological Survey Dept., Environment Dept.
<i>Other potentially involved bodies</i>	-
Benefits (mentioned in PoM)	Floods Directive (relieve stormwater collection systems), but mentions for increased recharge and for the aquatic environment
<i>Other potential benefits</i>	-

Measure	#48 – Conditions in building permits on stormwater management within each new dwelling
Water retention mechanism(s)	Slow/store runoff, increase infiltration, increase evap., increase soil water retention
Targeted policy objectives (mentioned in PoM)	Floods Directive 2007/60/EC WFD (quant. status)
<i>Other potentially applicable policy objectives</i>	-
Implementing bodies (mentioned in PoM)	Ministry of Interior, WDD
<i>Other potentially involved bodies</i>	-
Benefits (mentioned in PoM)	Floods Directive (relieve stormwater collection systems), but mentions for increased recharge
<i>Other potential benefits</i>	-

Measure	#49 – Feasibility study on permeable paving, street surfaces and sidewalks
Water retention mechanism(s)	Slow runoff; increase infiltration/recharge; increase evap.; increase soil water retention
Targeted policy objectives (mentioned in PoM)	Floods Directive 2007/60/EC
<i>Other potentially applicable policy objectives</i>	-
Implementing bodies (mentioned in PoM)	WDD, Town Planning and Housing Department, Ministry of Interior, Public Works Dept.
<i>Other potentially involved bodies</i>	-
Benefits (mentioned in PoM)	Floods Directive (relieve stormwater collection systems)
<i>Other potential benefits</i>	-

Measure	#86&87 – Restoration of hydromorphological characteristics and of riparian zones in selected river water bodies
Water retention mechanism(s)	Store & slow runoff; increase evap.
Targeted policy objectives (mentioned in PoM)	WFD (good ecol. status)
<i>Other potentially applicable policy objectives</i>	<i>Floods Directive; Nature Directives; WFD (quant. status)</i>
Implementing bodies (mentioned in PoM)	WDD, Environment Dept.
<i>Other potentially involved bodies</i>	-
Benefits (mentioned in PoM)	WFD (good ecol. status)
<i>Other potential benefits</i>	<i>Floods Directive; Nature Directives; WFD (quant. status)</i>

NWRMs in Cyprus' RBMP #1 – the present

❖ Identified “shortcomings”

- NWRM awareness & knowledge exists only in relation with (urban) stormwater management
- Multiple benefits of measures for riparian zones were not recognized
- Measures for WFD and FD do not recognize the benefits for the other
- Identified gaps in stakeholders participation are limited



NWRMs in Cyprus' RBMP #1 – the present

❖ Potential causes for shortcomings:

- Management of riparian zones and of aquatic ecosystems (esp. lotic) are new challenges in Cyprus – they arrived with the WFD
→ there is lack of experience
- Real problems with urban flooding forced authorities to engage with the problem
→ experiences were gained and are already available



NWRMs in Cyprus' RBMP #2 – the future

Lessons learnt from RBMP #1 assessment in the light of NWRMs

- Self-evidence of advantages of measures blurs the view when assessing their benefits and their trade-offs (especially in fields with lack of experience)
- Evaluation of WFD measures from an NWRM perspective improves the identification of (hidden) multiple benefits
- Detailed inspection of the working mechanisms of measures improves the identification of affected policy objectives
- Comprehension of the interrelations between working mechanisms of measures, policy objectives and benefits/trade-offs are crucial for assessment of measures



NWRMs in Cyprus' RBMP #2 – the future

- Opportunities – *where NWRM initiative helps to build measures*
 - The evaluation of proposed measures in the WFD-PoM from an NWRM point-of-view fosters a spherical, integrated approach to the measures and facilitates the identification of 1) policy objectives, 2) additional benefits and 3) stakeholders otherwise missed
- Opportunities – *where NWRM initiative helps to “sell” measures*
 - Implementation of SuDS in urban areas
 - Water retention – recharge – lotic ecosystems
 - Preservation of traditional terraces



NWRMs in Cyprus' RBMP #2 – the future

- **Limitations**
 - **NWRMs' definition is sometimes unclear still**
→ difficulties to decide whether a measures qualifies as NWRM
 - **NWRMs' retention effects are hard to quantify**
→ difficulties to convince decision makers
 - **Lack of awareness for NWRMs**
 - **The group of potential promoters on the national level is very small**



Some comments, suggestions & questions for the NWRM project

- The definition of NWRMs would benefit from further explanation and clarification, e.g.:
 - “NWRM appeal to a single purpose (i.e. restoring & maintaining aquatic ecosystems)” – are other environmental objectives sufficient too? Aquifer recharge?
 - How much construction works are “allowed” for NWRMs to facilitate/enhance “functions usually performed by natural ecosystems”?
- Provide guidance and methods to quantify the retention effect of different NWRMs



Some comments, suggestions & questions for the NWRM project

- Categorize NWRMs according to applicability in different European regions - clearly highlight NWRMs regional applicability. This could be a system of “degree of applicability” per region (e.g. +, ++, +++)
- Review the NWRMs’ description and adjust them for regions of applicability where possible. E.g., some forestry NWRMs referenced to peatland & boreal forests are applicable in mediterranean forests (water retention and erosion protection for e.g. afforestation)
- Do releases of environmental flow qualify as NWRM?
- “Buffer strips may not work in Mediterranean” – Evidence?

(Workshop#1 Synthesis report p25)



Thank you for your attention



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