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STORMWATER GUIDELINES

A NEW APPROACH APPLIED IN VENICE LAGOON

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MINISTERO DELLE INFRASTRUTTURE E DEI TRASPORTI
MAGISTRATO ALLE ACQUE
*Ufficio Tecnico per l'Antiquamento
della Laguna di Venezia*

Linee guida per la predisposizione dei Piani di Adeguamento ex L. 192/2004



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STORMWATER GUIDE LINEE - A NEW APPROACH APPLIED IN VENICE LAGOON

In application of **Law 192/04**, the stormwater outfalls in Venice Lagoon do not need a specific authorization, but they do need to have a specific **Plan** to be presented to Water Authority, with management procedures and prevention measures to avoid pollution.

In July 2010 some **Guidelines** have been published for the implementation of the Stormwater Plans.

The Guidelines are been wrote in **partnership between Envicon s.r.l., Thetis S.p.A., Consorzio Venezia Nuova and Venice Water Authority.**

ADVISORY ACTIVITY FOR THE MINISTRY OF INFRASTRUCTURE AND TRANSPORT – VENICE WATER AUTHORITY –

The knowledge acquired over the years has allowed us to:

- plan and design activity for the Ministry of infrastructure and transport – Venice Water Authority,

- advice and assist the Ministry of infrastructure and transport – Venice Water Authority,

- monitor activities for the Ministry of infrastructure and transport – Venice Water Authority,

- manufacture and supply of systems and control procedures and monitoring for the Ministry of infrastructure and transport – Venice Water Authority,

- training and dissemination of the activities carried out for the Ministry of infrastructure and transport – Venice Water Authority.

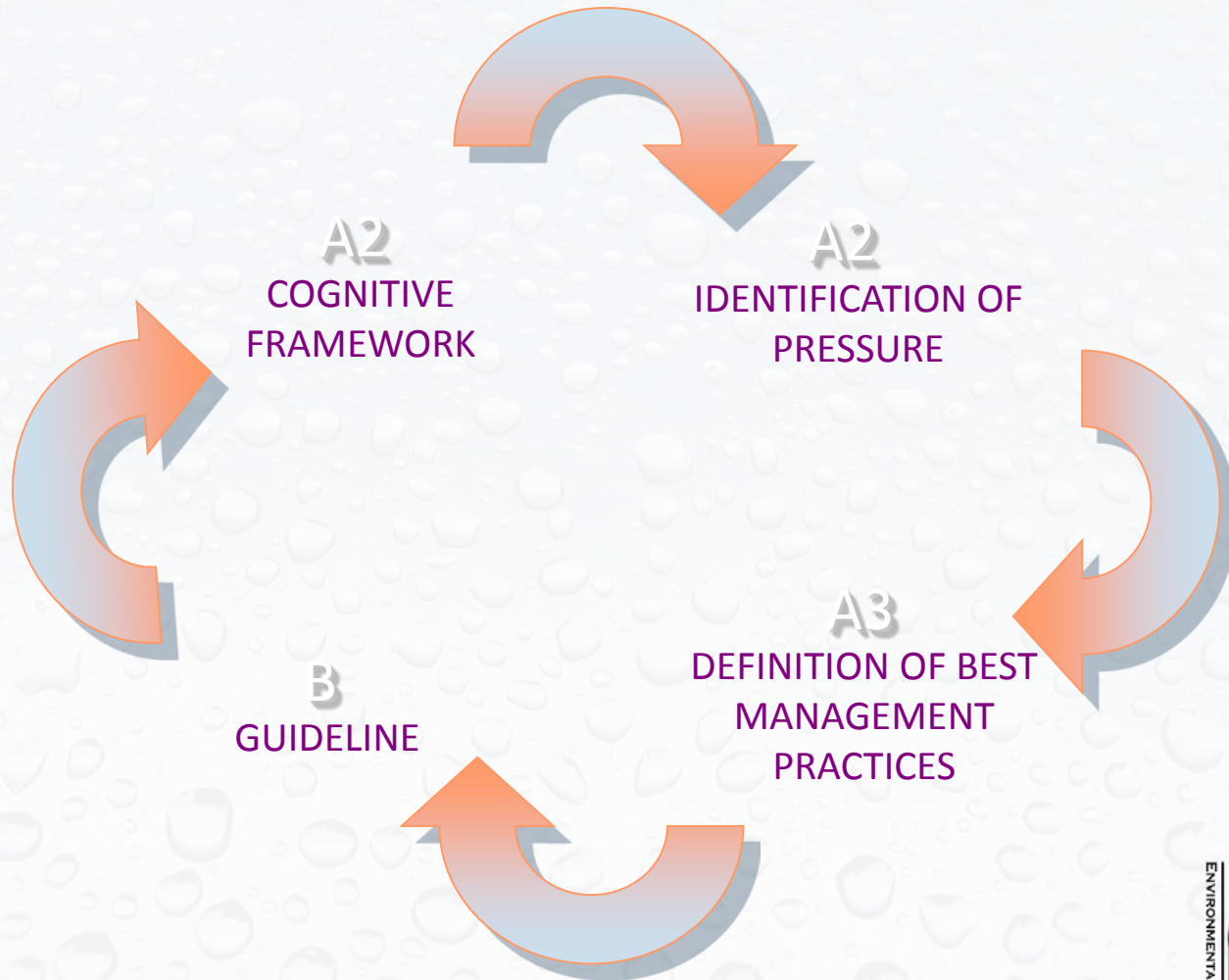
ADVISORY ACTIVITY FOR THE MINISTRY OF INFRASTRUCTURE AND TRANSPORT – VENICE WATER AUTHORITY –

Advisory activity for the Ministry of Infrastructure and Transport – Venice Water Authority – for the definition of methodological approach for stormwater management and treatment.

Collaboration with the Ministry of Infrastructure and Transport – Venice Water Authority - has led to the definition of the methodological approach for stormwater management and treatment by drawing up guidelines that suggest the structural and non structural BMPs depending on the activities and physical characteristics of the different sites.

Activity will continue with monitoring campaigns and development of models capable of assessing the amount of pollutants from stormwater runoff and efficiency of structural and non structural BMPs.

METHODOLOGICAL APPROACH FOR STORMWATER MANAGEMENT AND TREATMENT



METHODOLOGICAL APPROACH FOR STORMWATER MANAGEMENT AND TREATMENT

Guidelines for the preparation of Plans

- Definition of site-specific parameters for identifying the best solution and project management on stormwater runoff
- Identification of best management practices and design (structural and nonstructural solutions)
- Setting quali – quantitative objectives to be achieved in terms of environmental safeguard and protection of water resources

DEFINITION OF SITE-SPECIFIC PARAMETERS

Impacts arising from activity

Example of reference value

Destinazione d'uso	Manganese ($\mu\text{g/l}$)			Vanadio ($\mu\text{g/l}$)			Cromo totale ($\mu\text{g/l}$)			Rame ($\mu\text{g/l}$)			Ferro ($\mu\text{g/l}$)			Zinco ($\mu\text{g/l}$)		
	min	μ	max	min	μ	max	min	μ	max	min	μ	max	min	μ	max	min	μ	max
Centro città	10	104,6	800	1,1	12,9	93	0,5	8,2	80	6	55,8	800	230	3214	34000	20	140	1900
Residenziale multi familiare	3	74,4	800	0,8	9	42	0,6	6,2	42	2	41,3	250	70	1872	12000	15	295,7	1800
Venezia e Murano	3	60,8	196	1,6	5,7	30	1	6,8	25	8	64,2	290	60	1769	7500	17	280,6	1300
Aree industriali	10	126	600	1,8	25,5	112	0,7	7,2	33	6	78,3	700	175	2402	12200	22	318,5	2400
Aree commerciali	6	59,2	250	1,2	7,3	30	0,62	5,5	42	8	36	250	50	1682	12200	22	200	1800
Aree portuali	0	51,7	164	5	48	91	0,3	70,3	319	11,4	189,3	620	19	2563	9600	57,4	800	4730
Aeroporti	4	28,9	80	1,1	4,6	12	0,58	6,4	311	5	14,9	37	130	375	700	10	52	130
Reti stradali a scorrimento veloce	10	108,6	500	1,7	11	42	0,9	13,9	80	13	224	1000	220	4454	25000	27	778	4500
Strade a media e bassa percorrenza	10	131	800	1,1	19,4	93	1,1	9,7	80	6	98,3	800	260	3538	34000	22	263,8	1900
Aree verdi urbane sportive e ricreative		0,26					2,2		250	1,9		77400		748		18		1160
Parcheggi	3	43,4	230	0,8	13,8	112	0,5	5,6	31	2	31,9	290	70	943	7100	20	182	1300

ANALYSIS OF APPROACHES AND TECHNOLOGIES

- Approaches used
- Costs
- Success factors

Paese/Area	Sistemi di infiltrazione	Pavimentazioni alternative	Stagni (temporanei e permanenti)	Sistemi di fitodepurazione	Canali inerbiti e fasce tampone	Altri sistemi di ritenzione vegetati	Altre strutture (*)	LID	Manuali e linee guida
Europa Meridionale	Yellow	Orange	Orange	Orange	Red	Red	Red	Blue	Orange
Europa Nord occidentale	Green	Green	Green	Green	Yellow	Orange	Orange	Red	Green
Europa Orientale	Red	Red	Orange	Red	Red	Blue	Blue	Blue	Red
Cina	Orange	Blue	Yellow	Red	Blue	Blue	Blue	Blue	Red
Giappone	Green	Green	Yellow	Orange	Orange	Red	Yellow	Blue	Orange
Asia Sud-orientale	Red	Red	Orange	Red	Red	Blue	Blue	Blue	Red
America Settentrionale	Green	Green	Green	Green	Green	Yellow	Green	Yellow	Green
America Meridionale	Red	Blue	Yellow	Red	Blue	Blue	Blue	Blue	Orange
Sud Africa	Orange	Red	Yellow	Red	Red	Blue	Blue	Blue	Red
Australia e Nuova Zelanda	Green	Yellow	Green	Green	Green	Yellow	Orange	Orange	Green

Legenda



STORMWATER MANAGEMENT AND TREATMENT SYSTEMS

Non structural BMPs

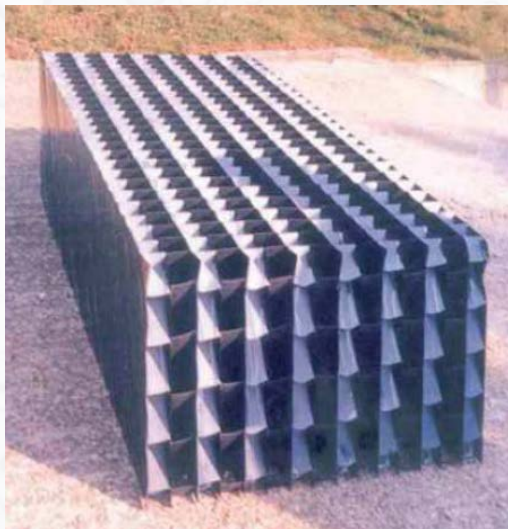
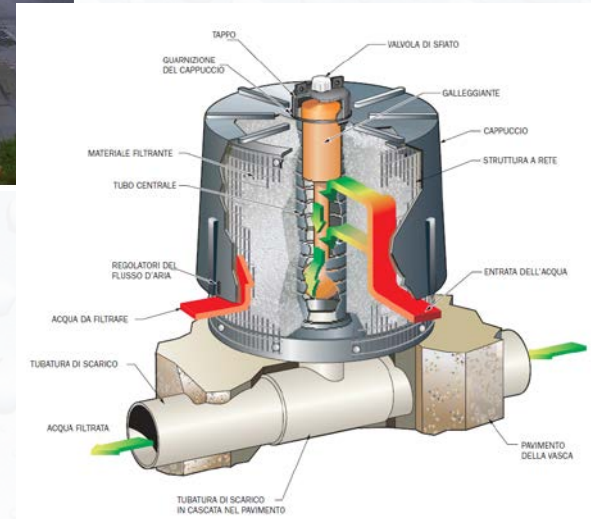
- Education, Recycling and Control of Pollution Sources
- Maintenance Practices



STORMWATER MANAGEMENT AND TREATMENT SYSTEMS

Structural BMPs

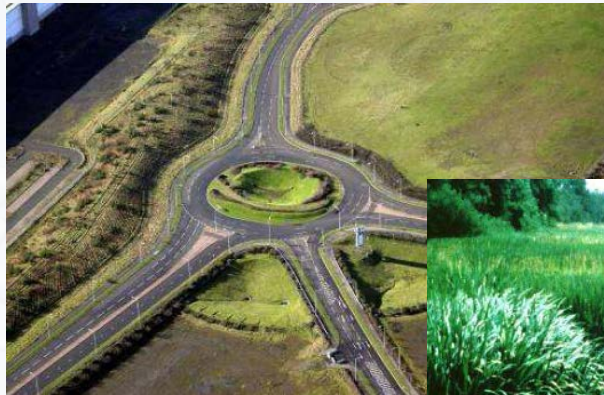
- Sedimentation tank/ Oil separators
- Filtration systems
- Runoff collection and reduction



STORMWATER MANAGEMENT AND TREATMENT SYSTEMS

Structural BMPs

- Infiltration systems
- Detention system
- Alternative road and paving structures







IDENTIFICATION OF BEST MANAGEMENT PRACTICES

Example of matrix for the assessment of Structural BMPs

Criteria	Environmental				CHIUSSINO Site Features		Technical (hydraulic)		Social	Economical			
	Removing potential pollutants	Parameters	Metals	PAH	Biocides	Reduction pollutants sources	contamination groundwater from	Protecting Infiltration capacity	Employment areas	Volumes reduction	Delay of flows	Aesthetic / natural / recreational value	Construction costs
Indicators	General	Metals	PAH	Biocides	Reduction pollutants sources	contamination groundwater from	Protecting Infiltration capacity	Employment areas	Volumes reduction	Delay of flows	Aesthetic / natural / recreational value	Construction costs	Maintenance costs
Granular activated carbon	Preferable	Preferable	Preferable	Preferable	Low	Not relevant/data not available	Not relevant/data not available	Low	Low	Low	Low	Low	Low
Perlite	Preferable	Preferable	Preferable	Preferable	Low	Not relevant/data not available	Not relevant/data not available	Low	Low	Low	Low	Low	Low
Zeolite	Preferable	Preferable	Preferable	Preferable	Low	Not relevant/data not available	Not relevant/data not available	Low	Low	Low	Low	Low	Low
Phosposorp	Preferable	Preferable	Preferable	Preferable	Low	Not relevant/data not available	Not relevant/data not available	Low	Low	Low	Low	Low	Low
Sand filters	Not better	Not better	Not better	Not better	Low	Not relevant/data not available	Not relevant/data not available	Low	Low	Low	Low	Low	Low

Legend (standards)

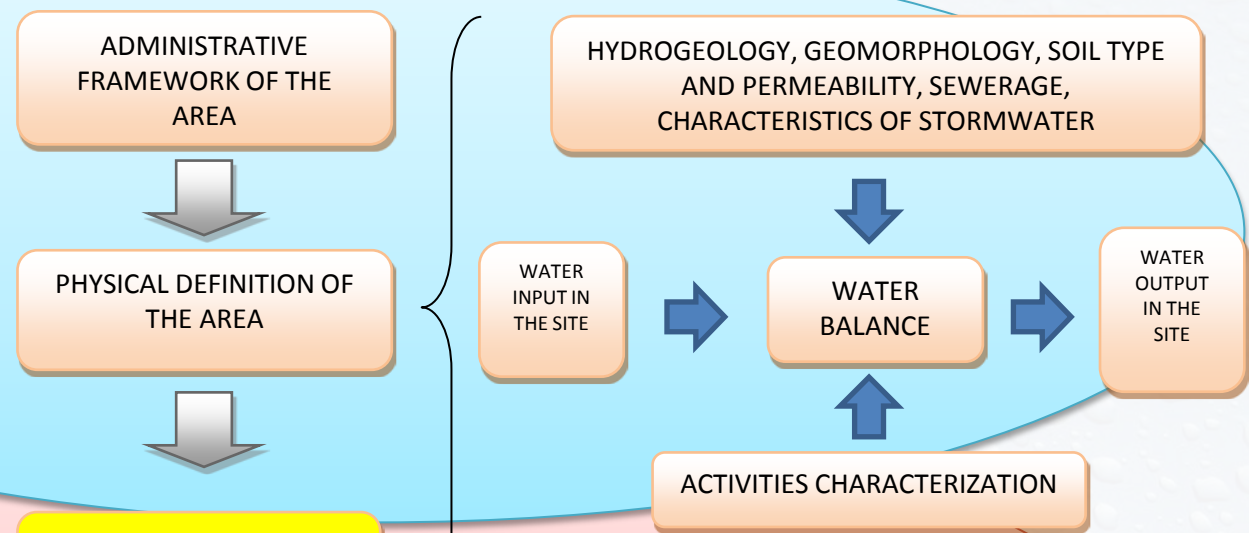
	Preferable		Low
			Middle
			High
	Not better		Not relevant/data not available



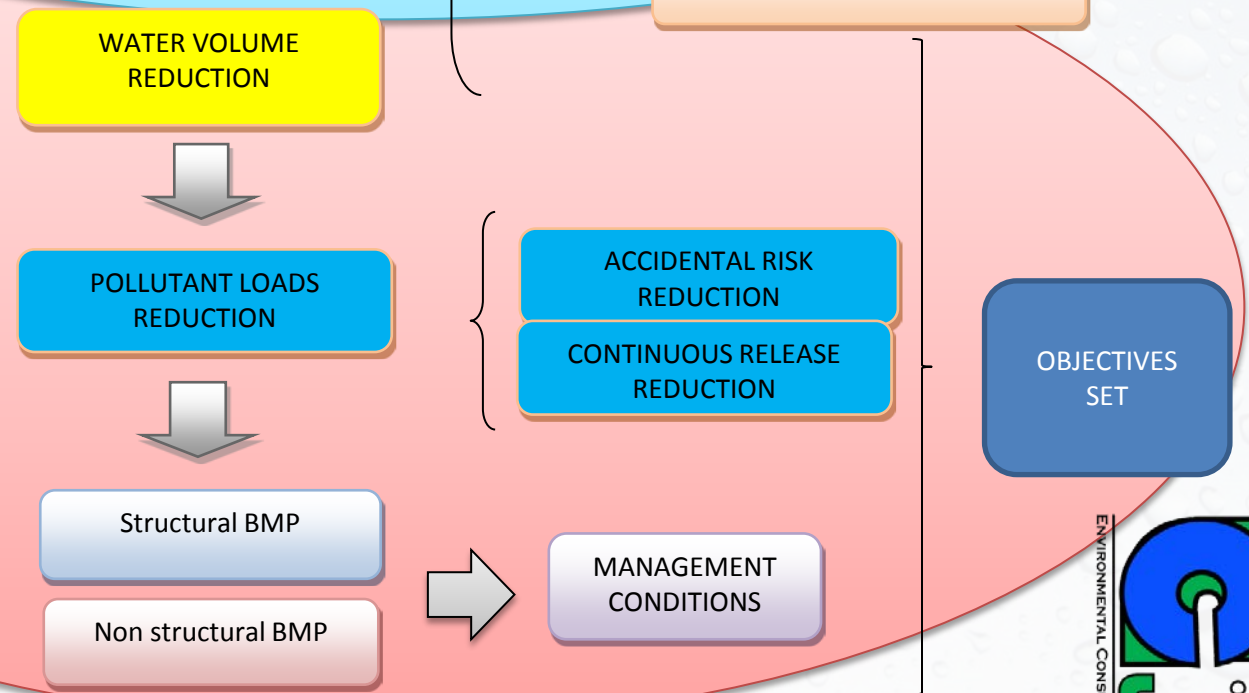
PLAN FOR STORMWATER MANAGEMENT AND TREATMENT

FACT STATE

Flowchart for the preparation of the Plan



REFORM STATE





TERRITORIAL
FRAMEWORK

