

**The Application of European Union Waste
Legislation to Conduct an Environmental Impact
Assessment of Landfill Sites
in Paphos District, Cyprus**

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Landfill of Waste

- [Council Directive 99/31/EC](#) of 26 April 1999 on the landfill of waste entered into force on 16.07.1999. The deadline for implementation of the legislation in the Member States was 16.07.2001.
- The objective of the Directive is to prevent or reduce as far as possible negative effects on the environment from the landfilling of waste, by introducing stringent technical requirements for waste and landfills.
- The Directive is intended to prevent or reduce the adverse effects of the landfill of waste on the environment, in particular on surface water, groundwater, soil, air and human health.

Landfill of Waste

- **It defines the different categories of waste (municipal waste, hazardous waste, non-hazardous waste and inert waste) and applies to all landfills, defined as waste disposal sites for the deposit of waste onto or into land. Landfills are divided into three classes:**
 - landfills for hazardous waste;
 - landfills for non-hazardous waste;
 - landfills for inert waste.

Landfill of Waste

- **The Directive does not apply to:**
 - the spreading on the soil of sludges (including sewage sludges and sludges resulting from dredging operations);
 - the use in landfills of inert waste for redevelopment or restoration work;

Landfill of Waste

- the deposit of unpolluted soil or of non-hazardous inert waste resulting from prospecting and extraction, treatment and storage of mineral resources as well as from the operation of quarries;
- the deposit of non-hazardous dredging sludges alongside small waterways from which they have been dredged and of non-hazardous sludges in surface water, including the bed and its subsoil.

Landfill of Waste

- **A standard waste acceptance procedure is laid down so as to avoid any risks:**
 - waste must be treated before being landfilled;
 - hazardous waste within the meaning of the Directive must be assigned to a hazardous waste landfill;
 - landfills for non-hazardous waste must be used for municipal waste and for non-hazardous waste;
 - landfill sites for inert waste must be used only for inert waste;
 - criteria for the acceptance of waste at each landfill class must be adopted by the Commission in accordance with the general principles of Annex II.

Landfill of Waste

- **The following wastes may not be accepted in a landfill:**
 - liquid waste;
 - flammable waste;
 - explosive or oxidising waste;
 - hospital and other clinical waste which is infectious;
 - used tyres, with certain exceptions;
 - any other type of waste which does not meet the acceptance criteria laid down in Annex II.

Landfill of Waste

- **The Directive sets up a system of operating permits for landfill sites. Applications for permits must contain the following information:**
 - the identity of the applicant and, in some cases, of the operator;
 - a description of the types and total quantity of waste to be deposited;
 - the capacity of the disposal site;
 - a description of the site;

Landfill of Waste

- the proposed methods for pollution prevention and abatement;
- the proposed operation, monitoring and control plan;
- the plan for closure and aftercare procedures;
- the applicant's financial security;
- an impact assessment study, where required under Council Directive 85/337/EEC on the assessment of the effects of certain public and private projects on the environment.

Landfill of Waste

- **Member States must ensure that existing landfill sites may not continue to operate unless they comply with the provisions of the Directive as soon as possible.**
- **Member States must report to the Commission every three years on the implementation of the Directive.**
- **On the basis of these reports, the Commission must publish a Community**

Landfill of Waste

- **On the basis of these reports, the Commission must publish a Community report on the implementation of the Directive.**

Studies: application and implementation

- **Assessing legal compliance with and implementation of the waste acceptance criteria and procedures by the EU-15**
 - » **Report**
 - » **Annexes**
- A similar study is being carried out for the EU-12. The final report will be published before the summer break 2010)

Studies: continued

- Study on the implementation of Directive 1999/31/EC on the landfill of waste in the EU-15
 - » Report
 - » Annexes
- Follow-up study on the implementation of Directive 1999/31/EC on the landfill of waste in EU-25

Studies:continued

- Organisation of awareness-raising events concerning the implementation of Directive 1999/31/EC on the landfill of waste, final report
 - » For 2007
 - » For 2008
- Waste Management Options and Climate Change
- Economic Valuation of Environment Externalities from Landfill Disposal and Incineration of Waste

Studies (continued)

- Report from the Commission to the Council and the European Parliament on the national strategies for the reduction of biodegradable waste going to landfills pursuant to Article 5(1) of Directive 1999/31/EC on the landfill of waste
- Commission working document with the annex to the report

Studies:continued

- Summary of EU Waste Legislation on Landfill
- Directive 99/31/EC on landfill of waste
Ancillary legislation relating to landfill of waste:
 - Commission Decision 2000/738/EC
concerning a questionnaire for Member States
reports on the implementation of Directive
1999/31/EC on the landfill of waste

Studies: continued

- Proposal for a Decision on acceptance criteria, [COM\(2002\) 512](#)
- [COUNCIL DECISION](#) of 19 December 2002 establishing criteria and procedures for the acceptance of waste at landfills pursuant to Article 16 of and Annex II to Directive 1999/31/EC (2003/33/EC)

Studies relative to islands and isolated settlements exempted by Member States under Article 3(4) of Landfill Directive

- Pursuant to Article 3(4) of the Landfill Directive Member States may declare, at their own option, parts or all of Articles 6d), 7i), 8a)iv), 10, 11 1) a), b) and c), 12a) and c), Annex I, points 3 and 4, Annex II except point 3, level 3, and point 4) and Annex III, points 3 to 5 to this Directive not applicable to:

Studies: continued

- A) landfill sites for non-hazardous or inert wastes with a total capacity not exceeding 15 000 tonnes or with an annual intake not exceeding 1 000 tonnes serving islands, where this is the only landfill on the island and where this is exclusively destined for the disposal of waste generated on that island. Once the total capacity of that landfill has been used, any new landfill established on the island shall comply with the requirements of this Directive;

Studies: continued

- B) landfill sites for non-hazardous waste or inert waste in isolated settlements if the landfill is destined for the disposal of waste generated only by that isolated settlement.

By 16 July 2003 Member States had to notify the Commission of the list of islands and isolated settlements that are exempted. The Commission shall publish the list of islands and isolated settlements.

1. INTRODUCTION:

Paphos District

- In Cyprus, household (urban) solid waste was collected from local authorities or private persons and was disposed of in various locations without taking the required measures for the protection of the environment. Pafos District, which is the object – study area of the Consultant's present project, has 37 uncontrolled landfills of which only one (1), that of Ay. Marinoudas, is included in the list of the 10 most dangerous landfills in Cyprus.

1. INTRODUCTION (con't)

➤ Having as an aim to restore these landfills, the Contracting Authority has completed the first phase of the project entitled: «Provision of Advisory Services for the preparation of a Strategic Plan, an Environmental and Technical and Economical study and Tender Documents for the restoration and aftercare of Uncontrolled Landfills in Cyprus».

1. INTRODUCTION (con't)

- Then, the Ministry of Interior / Solid Waste Management Division, with proclamation no. 3/2008, requested the provision of advisory services for the preparation of all necessary studies/documents for the restoration and aftercare of uncontrolled landfills in Pafos district and the supervision of construction works.

1. INTRODUCTION (con't)

- The present study pertains to the assessment of the environmental impact from the proposed projects for the restoration of uncontrolled landfills in Pafos district. The proposed projects have been identified in the context of the study during which the technical, economic and environmental parameters of the project have also been estimated.

1. INTRODUCTION (con't)

- The study was drawn in accordance with the Environmental Impact Assessment from Specific Projects Law. It also followed good practices as well as the appropriate technical methods, standards and models, where deemed fit.
- The objectives of the study are as follows:
- To track down and identify the factors and elements which affect the quality of the environment, the ecological balance of the area, the quality of life and the health of the population, the cultural tradition and aesthetic values.

1. INTRODUCTION (con't)

- The documented identification of the expected positive and negative impact on the environment, on public health and on commodities.
- To set out criteria for the protection of the environment.
- To timely brief the affected parties and collect their views in respect of the project.
- To assess the impact on the environment and to submit proposals in order to avoid or minimize any negative impact during the construction and management of the projects.

1.1. QUALITATIVE AND QUANTITATIVE CHARACTERISTICS OF LANDFILLS

- The following Table presents the names and locations of the landfills under examination as well as the estimated quantities of the deposited waste.

1.1. QUALITATIVE AND QUANTITATIVE CHARACTERISTICS OF LANDFILLS

Εκτιμώμενες ποσότητες αποτιθέμενων απορριμμάτων					
CODE	NAME OF AREA	YEARS OF OPERATION	WASTE AREA (m ²) before restoration	WASTE VOLUME (m ³)	
				URBAN	INERT
PF01	Νέο Χωριό	1980-2003 (23)	17.090,88	5.582	600
PF02	Χόλι	1990-2007 (17)	793,04	567	200
PF03	Φιλούσα Χρυσοχούς	1999-2007 (8)	1.054,51	864	400
PF04	Ζαχαριά	1998-2007 (9)	908,12	488	800
PF05	Δρυινιά	2001-2004 (3)	405,24	100-500	200
PF06	Ασπρογιά	1992-2005 (13)	122,12	764	60
PF07	Ακουρσός	1990-2007 (17)	4.673,11	1.000	400
PF08	Κάθηκας	2000-2007 (7)	837,91	500-1000	500
PF09	Τέρρα	1996-2007 (11)	2.941,82	2.807	100
PF10	Πόλις Χρυσοχούς	1975-2000 (25)	3.017,23	10.342	-
PF11	Κτιούσα	2000-2007 (7)	576,40	100-500	-
PF12	Παναγιά	1965-2007 (42)	684,09	4.677	300
PF13	Αναδιού	2001-2007 (6)	1.518,45	3	100
PF14	Φοίτη	1995-2003 (8)	3.272,05	1.000	30
PF15	Πολέμι	1990-2007 (17)	4.342,58	20.108	900
PF16	Αμαργέτη	1990-2007 (17)	927,29	945	-
PF17	Αγ. Μαρίνα Κελοκεδάρων	1980-2003 (23)	1.733,00	293	600
PF18	Πενταλιά	1995-2003 (8)	1.294,73	100-500	100
PF19	Γαλαταριά	1985-2003 (18)	2.457,10	50-200	500
PF20	Χολέτρια	1990-2004 (14)	2.020,72	2.870	600
PF21A	Κελοκέ-δαρα	1970-2003 (33)	1.620,37	703	100
PF21B	Κελοκέδαρα	1970-2003 (33)	415,50	201	200
PF22	Σαλαμιού	1984-2007 (23)	1.998,15	431	500
PF23	Αγ. Ιωάννης	1980-2002 (22)	915,67	588	100
PF24	Αγ. Γεώργιος	1998-2004 (6)	304,78	278	500
PF25	Τραχηπέδουλα	2001-2004 (3)	2.647,32	50-200	550
PF26	Κέδαρες	1990-2003 (23)	906,41	100-500	-
PF27	Πραϊτώρι	1994-2007 (13)	1.889,47	50-200	200

1.2. LANDFILL RISK ASSESSMENT

- The following table presents the risk rating given to each landfill based on the multi-criteria evaluation method. The risk study was carried out in the context of the technical and economic study of the project.

1.2. LANDFILL RISK ASSESSMENT (CON'T)

CODE	NAME OF AREA	RISK	CATEGORY OF RESTORATION MEASURES	PROPOSED PROJECTS							
				Removal of waste	Shaping of relief	Final covering	Draining management	Biogas management	Flood protection	Other projects	Environ. monitoring

Parameter	Characterisation	Proposed measures
Removal of waste	I	Removal of waste - transportation
	II	Removal of waste - transportation - backfilling
	III	Removal - reshaping in a plot for restoration of same landfill
Shaping of relief	I	Preservation of existing slopes
	II	Shaping of a new relief
	III	Shaping of a new relief, at levels
Final covering	I	Surface layer (soil coverage)
	II	Surface layer (soil coverage) and plantations
	III	Surface layer (soil coverage) and plantations over a layer of waste
	IIII	Surface layer (soil coverage) and plantations
		Geotextile
		Drainage layer
IIII	Protection / seal layer	
	Surface layer (soil coverage) and plantations	
	Geotextile	
	Drainage layer	
Drainage management projects	I	Lateral bulkhead for hydraulic isolation
	II	Collection network, collection tank, lateral bulkhead
Biogas management projects	I	Drainage channel (vertical drains)
	II	Drainage channel (vertical drains + horizontal closed network) + flare pit
Flood protection projects	I	Shaping of rainwater drain slopes in the final covering

1.2. LANDFILL RISK ASSESSMENT (CON'T)

Parameter	Characterisation	Proposed measures
	II	Shaping of rainwater drain slopes in the final covering, peripheral rainwater drainage ditches
Other infrastructure works	I	Fencing, gateway, signboard
	II	Fencing, gateway, signboard, water tank and irrigation network
	III	Fencing, gateway, signboard, lighting, water tank, irrigation network, internal road construction
Environmental monitoring projects	I	Meteorological data
	II	Meteorological data, surface drainages
	III	Meteorological data, surface drainages & control of groundwater
	IIII	Meteorological data, surface drainages, control of groundwater, qualitative and quantitative composition of drainages
	IIIII	Meteorological data surface drainages, control of groundwater, qualitative and quantitative composition of drainages, qualitative & quantitative composition of biogas, sedimentation control
All parameters	X	Not required

2. PROJECT DESCRIPTION

- The following tables present the landfills from where waste shall be removed and they present in summary the proposed restoration projects.

2. PROJECT DESCRIPTION (CON'T)

CODE	NAME OF AREA	RISK	CATEGORY OF RESTORATION MEASURES	PROPOSED PROJECTS							
				Removal of waste	Shaping of relief	Final covering	Draining management	Biogas management	Flood protection	Other projects	Environ. monitoring
PF01	Νέο Χερσόν		1980-2003 (23)			17.090,88			5.582	600	
PF02	ΜΕΣΣ		1990-2007 (17)			793,04			567	200	
PF03	Φιλιόσια Χερσονήσιος		1999-2007 (8)			1.054,51			864	400	
PF04	Σαγγαριό		1998-2007 (9)			908,12			488	800	
PF05	Δρυινό		2001-2004 (3)			403,24			100-500	200	
PF06	Λατομείο		1992-2005 (13)			122,12			764	60	
PF07	Ακροπόλις		1990-2007 (17)			4.673,11			1.000	400	
PF08	Καθίσκιος		2000-2007 (7)			837,91			500-1000	500	
PF09	Τέρρα		1996-2007 (11)			2.941,82			2.807	100	
PF10	Πόλιος Χερσονήσιος		1975-2000 (25)			3.017,29			10.342	-	
PF11	Κονόσια		2000-2007 (7)			576,40			100-500	-	
PF12	Παναγιώ		1965-2007 (42)			684,09			4.677	300	
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PF14	Φοίγι		1993-2003 (8)			3.270,05			1.000	30	
PF15	Πολύσι		1990-2007 (17)			4.342,58			20.108	900	
PF16	Αμαρηνίη		1990-2007 (17)			927,29			945	-	
PF17	Αγ. Μαρτίνα Καλοκαυδίων		1980-2003 (23)			1.739,00			293	600	
PF18	Παναγιώ		1995-2003 (8)			1.294,73			100-500	100	
PF19	Γαλαταριό		1985-2003 (18)			2.457,10			50-200	500	
PF20	Μολάριος		1990-2004 (14)			2.020,72			2.870	600	
PF21A	Καλοκαυδίων		1970-2003 (33)			1.620,97			703	100	
PF21B	Καλοκαυδίων		1970-2003 (33)			415,50			201	200	
PF22	Σαλαγιό		1984-2007 (23)			1.998,15			431	500	
PF23	Αγ. Βαθίη		1980-2002 (22)			915,67			588	100	
PF24	Αγ. Γεώργιος		1998-2004 (6)			304,78			278	500	
PF25	Τραχανάσιος		2001-2004 (3)			2.647,92			50-200	550	
PF26	Κάβος		1990-2003 (23)			906,41			100-500	-	
PF27	Πραγιά		1994-2007 (13)			1.889,47			50-200	200	

3. IMPACT FROM THE NON-IMPLEMENTATION OF THE PROJECT

3. Impact during operation

Impact on the environment in case of non implementation of the project

Factor	Extent of Impact		
	Low	Average	High
Soil pollution			X
Gaseous emissions		X	
Pollution of underground waters	X		
Impact on health		X	
Development trends		X	

3.Land Uses

Landfills from which waste shall be removed.

PF02	Holi
PF05	Drynia
PF06	Asproyia
PF07	Akoursos
PF08	Kathikas
PF11	Kinousa
PF13	Anadiou
PF14	Foiti (except plot 542)
PF16	Amargeti
PF17	Ay. Marina Kelokedaron
PF18	Pentalia
PF19	Galataria
PF21A	Kelokedara
PF21B	Kelokedara

3.Land Uses (con't)

PF22	Salamiou
PF23	Ay. Ioannis
PF24	Ay. Georgios
PF25	Trachypedoula
PF26	Kedares
PF27	Praitori
PF28	Ay. Nikolaos
PF30	Souskiou
PF32	Archimandrita
PF35	Ay. Marina Chrysohou
PF36	Lysos

3.Land Uses (con't)

- There is still waste in the following landfills:

CODE	AREA NAME
PF01	Neo Chorio
PF03	Filousa Chrysochora
PF04	Zakaria
PF09	Toni
PF10	Polia Chrysochora
PF14	Fotii
PF15	Poloni
PF20	Holotia
PF29	Ay. Mavrouda
PF31	Koraklia
PF33	Fallosa
PF34	Pomca

3. Impact during construction

3. Transportation / Road movement

Waste Transportation

CODE	AREA NAME	VOLUME OF WASTE					TO AREA	QUANTITY (m ³)	Distance (km)		
		ΑΣΤΙΚΑ	ΑΔΡΑΝΗ	ΥΓΡΑ	ΛΥΜΑ	ΛΥΜΑ					
PF01	Νέο Χωριό	35	3'	///	//	///	X	X	//	//	///
PF02	Χόλι	43	2'	//	/	/	X	X	X	X	X
PF03	Φύλασσα Χρυσσακούς	23	3'	X	//	///	X	X	//	//	/
PF04	Ζαχαριάς	24	3'	///	//	///, /	X	X	X	//	/
PF05	Δρυινιάς	52	2'	//	//	/	X	X	X	X	X
PF06	Ασπρογιά	55	2'	//	//	/	X	X	X	X	X
PF07	Ακουριάς	28	3'	//	//	/	X	X	X	X	X
PF08	Κάθηκας	28	3'	/	/	X	X	X	X	X	X
PF09	Τέρρα	31	3'	///	//	////, /	X	X	/	//	///
PF10	Πόλις Χρυσσακούς	57	2'	X	/	////	/	X	//	//	///
PF11	Κινούσα	42	2'	//	/	/	X	X	X	X	X
PF12	Παναγιά	34	3'	///	//	///'	X	X	/	/	//
PF13	Αναδίου	38	3'	//	/	/	X	X	X	X	X
PF14	Φοίτη	38	3'	X	X	X	X	X	X	X	X
PF15	Πολέμι	49	2'	///	//	////	X	X	/	//	///
PF16	Αμαργίτη	23	3'	//	//	/	X	X	X	X	X
PF17	Αγ. Μαρίνα Κελακεδάρων	25	3'	/	/	X	X	X	X	X	X

Environmental Impact

3.4. NOISE

3.4.1. ESTIMATED NOISE LEVELS

3.5. WASTE

3.6 Restoration of Location

- Measures for the restoration of the vegetation within the landfills in order to ensure the development of appropriate ecosystems and species in accordance with the vegetation of the wider areas in which the landfills are situated are proposed below.

3.6 Restoration (con't)

- To this end, the areas have been divided into three categories.
- Category 1: This category includes the areas with special ecological significance having as a criterion the following characteristics:
 - » Areas located within or adjacent to an area within the NATURA 2000 protection network.
 - » Areas hosting red book species
 - » Areas with no protection status, which, however, host significant habitats
 - » Forest areas

3.6 Restoration (con't)

- Category 2: This category includes the areas with small ecological significance having as a criterion the following characteristics:
 - » Areas with no special ecological interest, which are, however, characterized by the presence of wild vegetation with little human intervention.

3.6 Restoration (con't)

- Category 3: This category includes the areas with no ecological significance having the following characteristics:
 - » Areas with significant human intervention and deterioration, with the presence of crops, plantation of other species which are foreign for the area or urban development.
- For each category, the following guidelines are given as regards the restoration method.

3.6 Restoration (con't)

- Category 1:
 - » Plantation of appropriate endemic plants which will include trees, bushes and grasses in order to ensure to the best degree possible the development of the required ecosystems
 - » Use of local soil in order to avoid the introduction of foreign species
 - » Removal of foreign species during aftercare.

3.6 Restoration (con't)

- Category 2:
 - » Sporadic plantation of trees and bushes with low care and irrigation needs

3.6 Restoration (con't)

- Category 3:
- In this case, it is proposed to leave the vegetation in the area to grow on its own. The following are therefore proposed:
 - » To cover the landfills in which projects shall be carried out with 30 cm of soil.
 - » No action is proposed for the landfills in which no projects shall be carried out.

3.6 Restoration (con't)

- » In some cases, plantation is deemed fit for stabilization purposes. In such cases, bushes and/or trees shall be selected having as a criterion the reduced needs in care and water.
- » In areas in which the communities involved deem that it is fit to use the area in the future, landscaping should be carried out in accordance with the requirements for the anticipated use of each area.

3.6 Restoration (con't)

- The areas falling within categories 1 and 2, and depending on the restoration projects, the habitat should be monitored and managed in the first 5 years. Management shall include the following:
 - » Replacement of drying saplings.
 - » Removal of foreign species with mechanical means or singeing (category 1).
 - » Irrigation: Depending on the growth rate and on weather conditions, irrigation may possibly stop in the second year.

3.6 Restoration (con't)

- It is noted that, irrespective of the category in which they were included, the landfills which will be fully cleaned and returned to their owners shall not be subject to vegetation restoration. In such case, works for the cleaning, shaping and stabilization of the slopes shall be carried out and they will be covered with soil if deemed necessary. These areas will be declassified from landfills; therefore there shall be no need for any signaling, fencing or aftercare.

4. CONCLUSIONS

4.1 IMPACT DURING CONSTRUCTION



	TYPE			SIZE			DURATION		RESTORATION			TREATMENT		
	POSITIVE	NEUTRAL	NEGATIVE	WEAK	AVERAGE	STRONG	SHORT-TERM	LONG-TERM	REVERSIBLE	PARTLY REVERSIBLE	NONREVERSIBLE	TREATABLE	PARTLY TREATABLE	UNTREATABLE
SOIL			X	X			X		X			X		
AIR			X	X			X		X			X		
SURFACE WATER			X		X		X		X			X		
UNDERGROUND WATER			X	X			X		X			X		
FLORA			X	X			X		X			X		
FAUNA		X												
ACOUSTIC ENVIRONMENT			X	X			X		X			X		
LAND USE			X	X			X		X			X		
NATURAL RESOURCES		X												
SOCIO-ECONOMIC		X												

4.2. IMPACT DURING OPERATION

4.2 IMPACT DURING OPERATION

	TYPE			SIZE			DURATION		RESTORATION			TREATMENT		
	POSITIVE	NEUTRAL	NEGATIVE	WEAK	AVERAGE	STRONG	SHORT-TERM	LONG-TERM	REVERSIBLE	PARTLY REVERSIBLE	NONREVERSIBLE	TREATABLE	PARTLY TREATABLE	UNTREATABLE
SOIL	X				X			X						
AIR	X				X									
SURFACE WATER	X				X									
UNDERGROUND WATER	X				X									
FLAURA	X				X									
FAUNA		X												
ACOUSTIC ENVIRONMENT		X												
LAND USE	X					X								
NATURAL RESOURCES		X												
SOCIO-ECONOMIC	X					X								

4.2. IMPACT DURING OPERATION (con't)

	TYPE			SIZE			DURATION		RESTORATION			TREATMENT		
	INDIRECT	PERMANENT	REVERSIBLE	SMALL	MODERATE	EXTENSIVE	SHORT-TERM	LONG-TERM	REVERSIBLE	IRREVERSIBLE	MONITORING	RESTORATION	MITIGATION	
RESIDENCE		X												
TRANSPORTATION AND CIRCULATION		X												
HUMAN HEALTH	X				X									
AESTHETIC	X				X									
TOURISM - LEISURE		X												
CULTURAL HERITAGE		X												
PROTECTED AREAS		X												

Acknowledgement

- Atlantis Consulting, Ltd.

Before waste and sustainability: Reduse, Reuse, and Recycle



Native American Chief Seattle

The Earth does not belong to man, man belongs to the earth.

All things are connected like the blood that unites us all.

Man did not weave the web of life, he is merely a strand in it.

Whatever he does to the web, he does to himself