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| UBIFLOOD project |
| Flood Warning and management system (FWMS) Matrix |
|  |
| University of Nice – Sophia Antipolis / Polytech’Nice-Sophia930 route des Colles, 06 903 Sophia Antipolis Cedex, France |
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# Flood Sensitivity Matrix

Results from these matrixes will provide:

1. General city description
2. City characterization regarding area and population
3. Characterization of flooding
	1. Duration of flood
	2. Number of people affected
	3. Known flooded surface
4. Specify different types of flooding
	1. River flooding
	2. Sea level rise flooding
	3. Flash floods
		1. High precipitation
		2. Storm sewage capacity
5. Past flood events – records
6. Flood damage estimation – Does flood damage assessment exist?
7. Flood management planning – Does it exist and known level of defence?
8. Flood warning and management system – Does it exist and technical features ?

Table 1: Flood Sensitivity Matrix

|  |
| --- |
| **A. City Description** |
| **City name** |  |
| **1. City location** |  |
| 1. Is city in coastal area? (Y or N)
 | Yes |
| 1. Value of area slope?

[%] 0 – 5 = flat terrains[%] 5 – 10 = low/graduate slope[%] 10 – 20 = moderate slope[%] 20 – 30 = steep slope[%] above 30 = very steep slope | 0 – 5%  |
|  |
| 1. Is city near or on a river(s), other freshwaters? (Y or N)
 | Yes |
| 1. Comment
 | The country is a island with 15% of the land area low-lying  |
| **2. Hydrological Situation** |  |
| 1. Freshwaters extension
 | Reservoirs, rivers, estuaries converted to fresh water storage |
| 1. Freshwaters uses
 | Domestic water supply |
| **3. Precipitation (total amount/year)?** |  |
| 1. Value of rain intensities for events higher then 100mm/h?
 | Mean annual rainfall : 2,346mm |
| **B. Size characteristics of city** |
| 1. Area in square kilometres (km2)
 | 704 sq km |
| 1. City population
 | 4.48 million |
| **C. Characterization of flooding** |
| 1. Duration of flood event (average) (hours, days...)
 | 5 hours |
| 1. Number of people affected with flood
 | NIL |
| 1. Known surface of city affected with flood (km2)
 | 66 ha |
| * + - 1. **Different types of flooding**
 |
| 1. Flooding due sea level rise (Y, N, comment)
 | N |
| 1. River flooding (Y, N, comment)
 | Y |
| 1. Flash flooding
 |  |
| 1. Due to high precipitation (Y, N, comment)
 | Y |
| 1. Due to small capacity of storm sewage system (Y, N, comment)
 | N |
| * + - 1. **Past flood events**
 |
| 1. Are past events recorded in order to see spatial scale of flooding (Y, N, comment)
 | Y |
| 1. Are past events recorded water levels of past floods (Y, N, comment)
 | N |
| * + - 1. **Flood damage estimation**
 |
| 1. Is flood damage estimation present on city level? (Y, N, comment)
 | N |
| * + - 1. **Flood management planning**
 |
| 1. Does flood management plan exist on city level? (Y, N, comment)
 | Y (partially) |
| 1. If yes, is it civil sector? (Y or N)
 | Y |
| 1. If yes is it private sector? (Y or N)
 | N |
| 1. Are responsibilities in flood management clearly specified? (Y, N, comment)
 | N |
| 1. Does it specify the level of defence?
 | Y (partially) |
| 1. When FMP is established (year)?
 | NA |
| 1. How long is review period of FMP?
 | NA |
| 1. What are the target areas of the plan (floodplains, city planning, etc? (specify)
 | City Planning |
| 1. Is the city self-regulating regarding flood issues? (Y, N, comment)
 | Y |
| 1. Are the following sectors vulnerable to the consequences of floods

H – high level of preparedness and readinessM – to be aware of risk and to know how to balance L – to have no awareness of risk at all |  |
| 1. Communication system? (H, M, L)
 | M |
| 1. Transportation system? (H, M, L)
 | M |
| 1. Public transport? (H, M, L)
 | H |
| 1. Electricity supply systems? (H, M, L)
 | H |
| 1. Drinking water and supply network? (H, M, L)
 | H |
| 1. Energy generation and distribution system? (H, M, L)
 | M |
| 1. Local business, industry, and economy? (H, M, L)
 | M |
| 1. Health-care facilities? (H, M, L)
 | H |
| 1. L and use? (H, M, L)
 | H |
| 1. Parks and recreation areas? (H, M, L)
 | H |
| 1. Cultural and religious heritage? (Y or N)Tourism? (H, M, L)
 | H |
| * + - 1. **Threat of natural hazards**
 |
| 1. Earthquake? (Y or N) | N |
| 2. Wind storm? (Y or N) | Y |
| 3. River flood? (Y or N) | Y |
| 4. Flash rainwater flood or extreme precipitation? (Y or N) | Y |
| 5. Coastal Flooding (sea level rise)? (Y or N) | Y |
| 6. Tsunami? (Y or N) | N |
| 7. Drought? (Y or N) | N |
| 8. Volcano? (Y or N) | N |
| 9. Landslide? (Y or N) | N |
| 10. Storm surge? (Y or N) | Y |
| 11. Extreme temperature? (Y or N) | N |
| 12. Latest extreme event and extension? | 2 hr July 2010 |
| * + - 1. **Disaster response system**
 |
| 1. Does a disaster response system exist in the city? (Y or N)
 | N |
| 1. If yes, specify to what disaster specified in h section?
 |  |
| 1. If yes, specify who is managing the system? (Public or Private sector)
 |  |
| 1. Is the response system comprehensive and equipped for all natural hazards specified? (Y or N)
 | N |
| 1. Is the disaster response system regularly practiced? (Y or N)
 | NA |

## Source

1. [2009] - Neeraj Prasad, Federica Ranghieri, Fatima Shah, Zoe Trohanis, Earl Kessler, Ravi Sinha, **Climate Resilient Cities**, THE WORLD BANK Washington, D.C.
2. Slope ranges - <http://www.dudh.gov.bt/Thimphustructural/partthree/3.5.html>

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 Table 2: Flood warning and management system (FWMS) matrix

Flood Diagnostic and Management System (FDMS)

Network Communication System

Devices to collect data from persons

Devices to collect data on the ground

Personal devices to inform the population

Public devices to inform the population

|  |
| --- |
| **A. Flood Diagnostic and Management System** |
| 1. Is there any FDMS ? (Y/N)
 |  |
| 1. Is there any standard associated to the interfaces of the FDMS ? (Y/N, comments)
 |  |
| 1. type of network connection (comments)
 |  |
| 1. Is it an open software system ? (Y/N, comments)
 |  |
| 1. Is it a distributed or centralized system ? (comments)
 |  |
| 1. what is the architecture of the FDMS ? (comments)
 |  |
|  |  |
| 1. other comments
 |  |
| 1. other features
 |  |
| **B. Network Communication System** |
| Is there a global network system for the FWMS ? (Y/N, comments) |  |
| Is there only one homogeneous network or many heterogeneous networks ? (Y/N) interconnected or not ? (comments) |  |
| For each network :  |  |
|  |  |
| Technology (name) |  |
| IP based ? (Y/N) others ? (comments) |  |
| Type of reliability (QoS, without packet loss...) (comments) |  |
| What kind of communications ? data ? text ? voice ? (comments)  |  |
| Maximum Volume of data (in both ways) (comments) |  |
| Maximum Bandwith of the communications (comments) |  |
| Type of security supported by the network (comments) |  |
| other features  |  |
|  |  |
| Technology (name) |  |
| IP based ? (Y/N) others ? (comments) |  |
| Type of reliability (QoS, without packet loss...) (comments) |  |
| What kind of communications ? data ? text ? voice ? (comments)  |  |
| Maximum Volume of data (in both ways) (comments) |  |
| Maximum Bandwith of the communications (comments) |  |
| Type of security supported by the network (comments) |  |
| other features  |  |
|  |  |
| Technology (name) |  |
| IP based ? (Y/N) others ? (comments) |  |
| Type of reliability (QoS, without packet loss...) (comments) |  |
| What kind of communications ? data ? text ? voice ? (comments)  |  |
| Maximum Volume of data (in both ways) (comments) |  |
| Maximum Bandwith of the communications (comments) |  |
| Type of security supported by the network (comments) |  |
| other features  |  |
|  |  |
| other comments  |  |
| **C. Devices to collect data on the ground** |
| For each device :  |  |
|  |  |
| Type of the device (comments) |  |
| Type of supported sensors (comments) |  |
| Type of the collected data (comments) |  |
| Data sampling frequency (comments) |  |
| Type of network connection (comments) |  |
| Powered using batteries or AC (comments) |  |
| Local data processing ? (Y/N) |  |
| Location on these devices ? (Using GPS, Cellular positioning, other, ...) (Y/N, comments) |  |
| Fixed or mobile device ? (Y/N) |  |
| Remote monitoring system of the device ? (Y/N) |  |
| Other features  |  |
|  |  |
| Type of the device (comments) |  |
| Type of supported sensors (comments) |  |
| Type of the collected data (comments) |  |
| Data sampling frequency (comments) |  |
| Type of network connection (comments) |  |
| Powered using batteries or AC (comments) |  |
| Local data processing ? (Y/N) |  |
| Location on these devices ? (Using GPS, Cellular positioning, other, ...) (Y/N, comments) |  |
| Fixed or mobile device ? (Y/N) |  |
| Remote monitoring system of the device ? (Y/N) |  |
| Other features  |  |
|  |  |
| Type of the device (comments) |  |
| Type of supported sensors (comments) |  |
| Type of the collected data (comments) |  |
| Data sampling frequency (comments) |  |
| Type of network connection (comments) |  |
| Powered using batteries or AC (comments) |  |
| Local data processing ? (Y/N) |  |
| Location on these devices ? (Using GPS, Cellular positioning, other, ...) (Y/N, comments) |  |
| Fixed or mobile device ? (Y/N) |  |
| Remote monitoring system of the device ? (Y/N) |  |
| Other features  |  |
|  |  |
| other comments  |  |
| **D.** **Devices to collect data from persons** |
| For each device :  |  |
|  |  |
| Type of the device (comments) |  |
| Type of supported sensors (comments) |  |
| Type of the collected data (comments) |  |
| Data sampling frequency (comments) |  |
| Type of network connection (comments) |  |
| Powered using batteries or AC (comments) |  |
| Local data processing ? (Y/N) |  |
| Location on these devices ? (Using GPS, Cellular positioning, other, ...) (Y/N, comments) |  |
| Fixed or mobile device ? (Y/N) |  |
| Remote monitoring system of the device ? (Y/N) |  |
| Other features  |  |
|  |  |
| Type of the device (comments) |  |
| Type of supported sensors (comments) |  |
| Type of the collected data (comments) |  |
| Data sampling frequency (comments) |  |
| Type of network connection (comments) |  |
| Powered using batteries or AC (comments) |  |
| Local data processing ? (Y/N) |  |
| Location on these devices ? (Using GPS, Cellular positioning, other, ...) (Y/N, comments) |  |
| Fixed or mobile device ? (Y/N) |  |
| Remote monitoring system of the device ? (Y/N) |  |
| Other features  |  |
|  |  |
| Type of the device (comments) |  |
| Type of supported sensors (comments) |  |
| Type of the collected data (comments) |  |
| Data sampling frequency (comments) |  |
| Type of network connection (comments) |  |
| Powered using batteries or AC (comments) |  |
| Local data processing ? (Y/N) |  |
| Location on these devices ? (Using GPS, Cellular positioning, other, ...) (Y/N, comments) |  |
| Fixed or mobile device ? (Y/N) |  |
| Remote monitoring system of the device ? (Y/N) |  |
| Other features  |  |
|  |  |
| other comments  |  |
| **E. Public Devices to inform the population** |
| For each device : |  |
|  |  |
| Type of device (public display, public audio alert system, public broadcasting system...) (comments) |  |
| Location on these devices ? (Using GPS, Cellular positioning, other, ...) (Y/N, comments) |  |
| Fixed or mobile device ? (Y/N) |  |
| Type of network connection (comments) |  |
| Dedicated to the alert system or shared with other services ? (comments) which one ? (comments)  |  |
| Remote monitoring system of the device ? (Y/N, comments) |  |
| Other features  |  |
|  |  |
| Type of device (public display, public audio alert system, public broadcasting system...) (comments) |  |
| Location on these devices ? (Using GPS, Cellular positioning, other, ...) (Y/N, comments) |  |
| Fixed or mobile device ? (Y/N) |  |
| Type of network connection (comments) |  |
| Dedicated to the alert system or shared with other services ? (comments) which one ? (comments)  |  |
| Remote monitoring system of the device ? (Y/N, comments) |  |
| Other features  |  |
|  |  |
| Type of device (public display, public audio alert system, public broadcasting system...) (comments) |  |
| Location on these devices ? (Using GPS, Cellular positioning, other, ...) (Y/N, comments) |  |
| Fixed or mobile device ? (Y/N) |  |
| Type of network connection (comments) |  |
| Dedicated to the alert system or shared with other services ? (comments) which one ? (comments)  |  |
| Remote monitoring system of the device ? (Y/N, comments) |  |
| Other features  |  |
|  |  |
| other comments  |  |
| **F. Personal Devices to inform the population** |
|  |  |
| For each device :  |  |
|  |  |
| Type of device (pda, mobile phone...) (comments) |  |
| Location on these devices ? (Using GPS, Cellular positioning, other, ...) (Y/N, comments) |  |
| Fixed or mobile device ? (Y/N) |  |
| Type of network connection (comments) |  |
| Remote monitoring system of the device ? (Y/N, comments)  |  |
| other features  |  |
|  |  |
| Type of device (pda, mobile phone...) (comments) |  |
| Location on these devices ? (Using GPS, Cellular positioning, other, ...) (Y/N, comments) |  |
| Fixed or mobile device ? (Y/N) |  |
| Type of network connection (comments) |  |
| Remote monitoring system of the device ? (Y/N, comments)  |  |
| other features  |  |
|  |  |
| Type of device (pda, mobile phone...) (comments) |  |
| Location on these devices ? (Using GPS, Cellular positioning, other, ...) (Y/N, comments) |  |
| Fixed or mobile device ? (Y/N) |  |
| Type of network connection (comments) |  |
| Remote monitoring system of the device ? (Y/N, comments)  |  |
| other features  |  |
|  |  |
| other comments  |  |