INTEGRATED FLOOD RISK MANAGEMENT

ISSUES, SCOPE AND CHALLENGES

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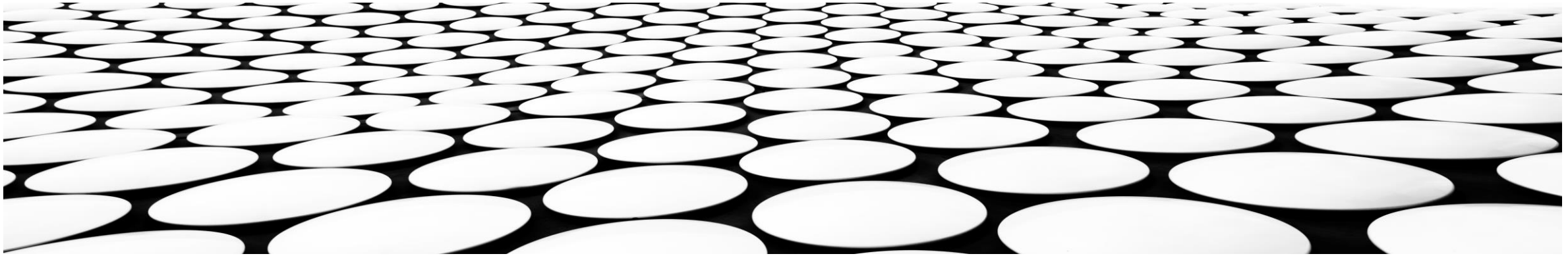


TYPES OF FLOOD

https://youtu.be/TByaaty3ReY

Riverine Flooding (Fluvial)

https://youtu.be/r04udzGE4VM

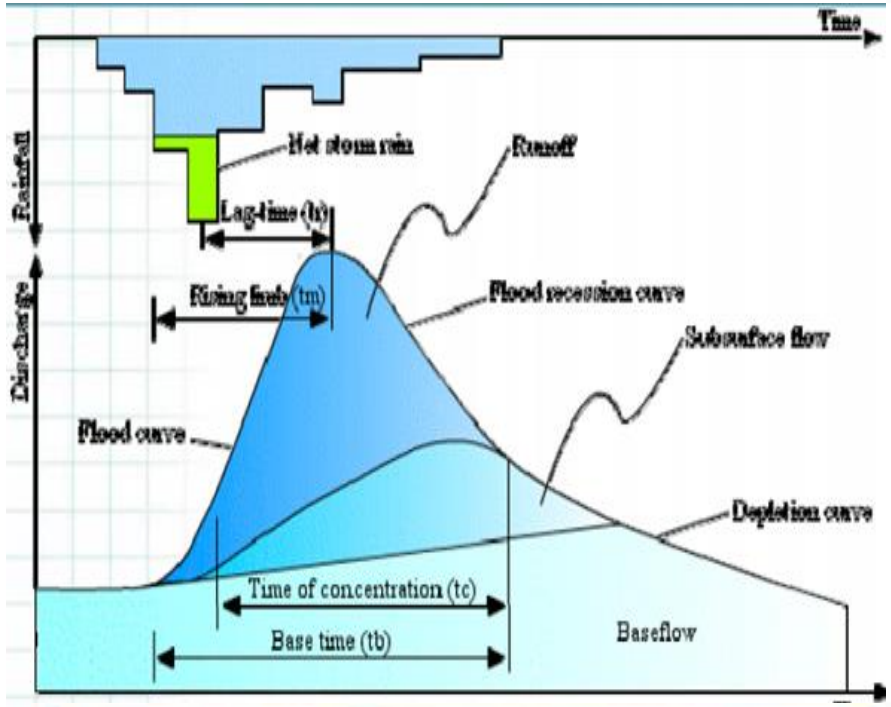
Flash Floods

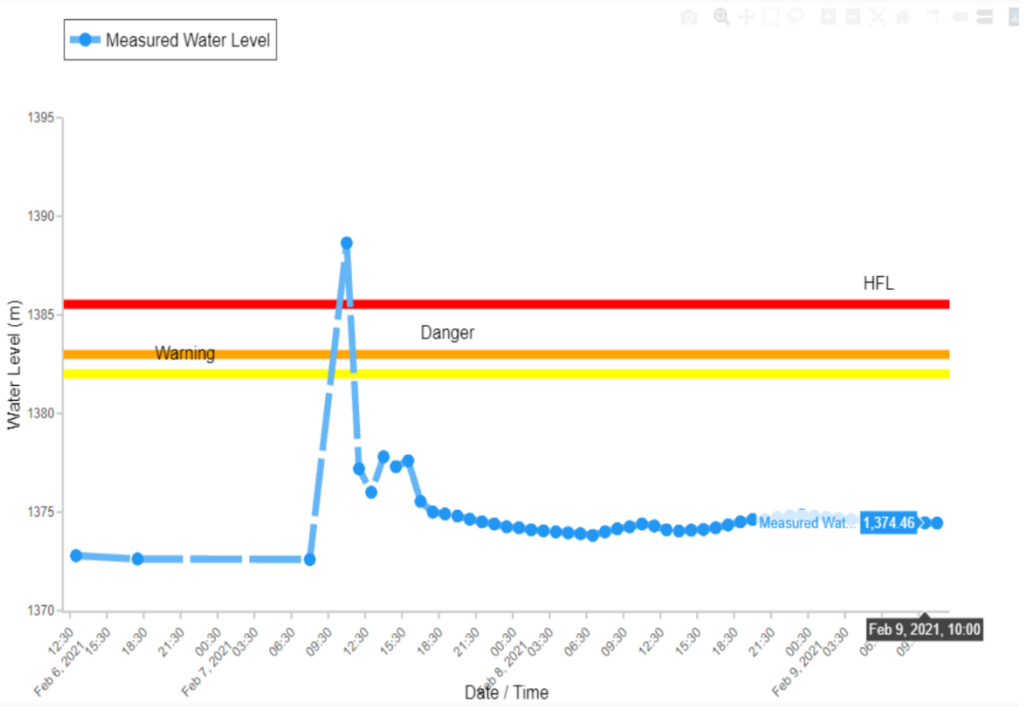
Urban

Storm Water Flooding (Pluvial)

Coastal Flood

FLUVIAL FLOODING VIS-A-VIS FLASH FLOODS



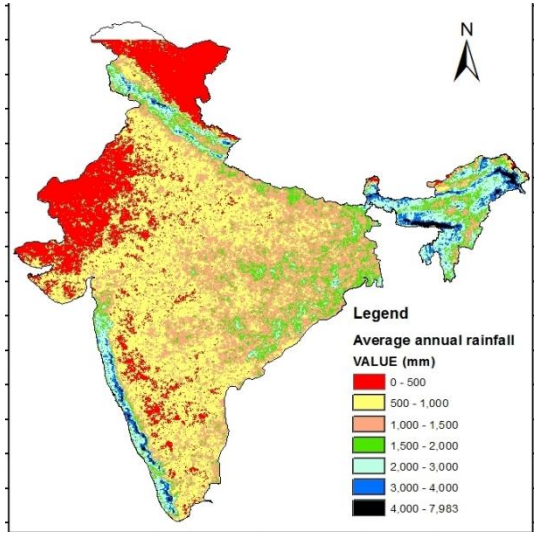


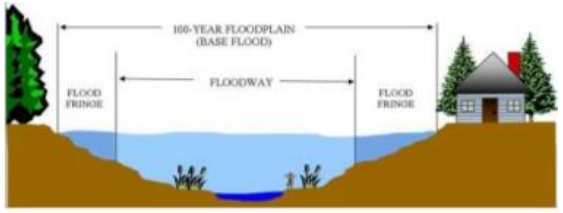
FLOODS AND DEVELOPMENT

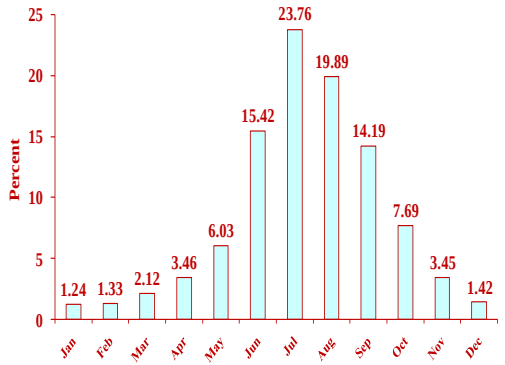
- Flood plains present with developmental opportunities. Fertile lands, Ease of construction and communication, eco-system services
- Living in the flood plains also exposes to the risk of recurrent flood damages and disruption. Still, the benefits outweigh the dangers in the short and medium terms.
- Amongst various natural disasters, the temporal windows for floods are well defined, which makes the victims more tolerant.
- With increasing regularity, flooding causes significant impacts for Asia and the Pacific. More than 45% of disaster losses in Asia and the Pacific from 2012 to 2021 were triggered by flooding.
- An understanding of the interplay between floods, the development process and poverty is vital in order to ascertain the way in which current and future development processes can and do increase flood risk.
- The rapid expansion of densely populated areas has the combined effect of increasing the number of people and value of assets at risk and land use changes contribute to the intensity of local flooding.

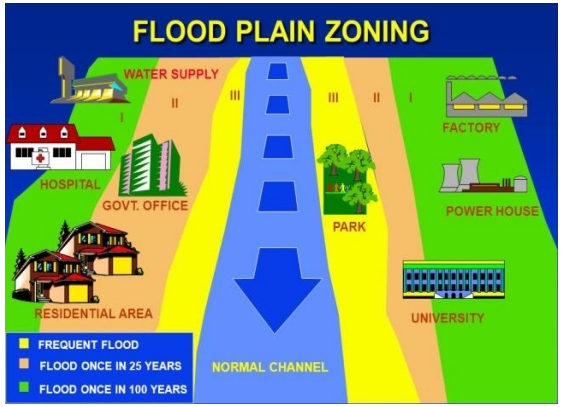
WHAT IS FLOOD RISK

Hazard × Exposure × Vulnerability









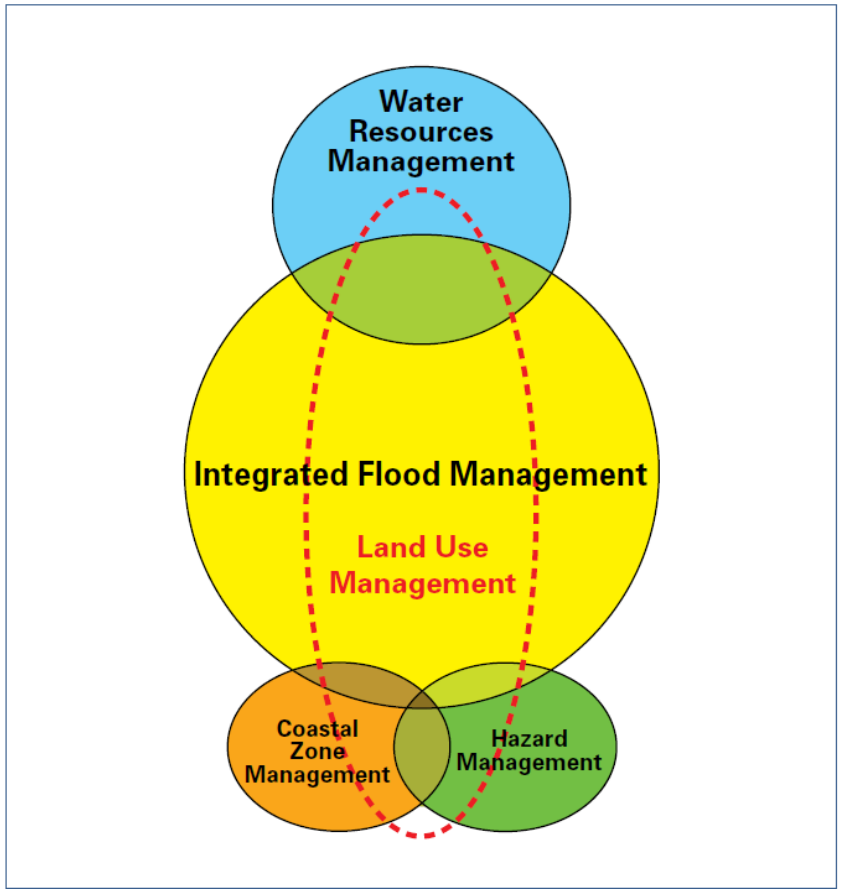
Channel Encroachment
Faulty Reservoir Operation - High Reservoir Level Unplanned development
Drainage congestion in low lying areas
Narrow exit to sea – Coastal Flooding
Embankment Breaches

WHAT IS INTEGRATED FLOOD MANAGEMENT

- Water occurs in nature in form of precipitation and consequent overland flows, when the flows exceed the normal carrying capacity of the channel, the flows result in floods. Land (topography and Usage) and water resources development play a vital part in flood impacts and strategies for risk management.
- Integrated flood risk management (IFM) is a part of the overall strategy of Integrated Water Resources Development and Management
- IWRM is defined as “a process which promotes the coordinated management and development of water, land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems (GWP)
- As a component of the IWRM process, IFM entails minimizing loss of life and properties of humans and animals, avoiding mass disruption of life processes and preventing harmful effects on environment and development initiatives
- UN- SDGs 1,2,3,6,8,9,11,13,14 and 15 are involved or are impacted by the adverse effects of floods and consequent damages.
- In this context, it becomes important to view the flood risks and mitigation as an essential component of our development process. Developing countries are particularly vulnerable to these impacts.

Conceptualizations of IFM

GWP concept of IFM



WMO concept of IFM

COMPONENTS OF AN IFM PROGRAMME

- Manage the water cycle as a whole through a River Basin Approach;
- Integrate land and water management;
- Manage risk and uncertainty;
- Adopt a best mix of strategies;
- Ensure a participatory approach; and
- Adopt integrated hazard management approaches.

INTEGRATION COMPONENTS

- **Basin-level integration**. Consider the complete river basin: the upper catchment (Storages), the mid-river reaches (preserving Flood Plains), and the lower reaches, estuary, and coastal areas (Improve Conveyance).
- **Stakeholder integration**. Needs of all stakeholders of the flood-affected land, Include human population and the environmental systems. Wide ranging consultations with vulnerable groups.
- **Vertical integration**. All administrative levels of government onboarded. Institutional inter-operability. Close real time cooperation between disaster forecasters, operational agencies and managers.
- **Horizontal integration**. Investment planning, flood hazard potential assessments, water resources, land planning, meteorology and forecasting, emergency response, search and rescue, economics, and finance.

MECHANISMS AVAILABLE

- Structural Measures
  - Involves building and operating flood management infrastructure with or without associated uses

- Non Structural Measures
  - Providing advance information and warnings,
  - Creating legal and institutional requirements for regulating development and improving resilience
  - Economical and financial incentives
  - Stakeholder participation in disaster management

STRUCTURAL MEASURES

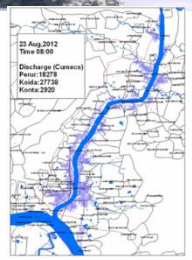
SN	MEASURES	Remarks
1	DAMS & RESERVOIRS	Integrated operation & adequate flood cushion. **More than 5000 dams in India but flood cushion only in few**
2	INTER BASIN TRANSFER	Interlinking of rivers Yet to be implemented **except recently approved Ken Betwa Link Project**
3	EMBANKMENT	Around **37,000 km** embankment constructed
4	ANTI EROSION WORKS	Around **2900 nos** of anti erosions works constructed
5	CHANNEL/DRAINAGE IMPROVEMENT	Around **39,700 km** drainage channels constructed
6	RIVER DIVERSION	Restoration of river Dibang near Dholla-Hatighuli in Assam

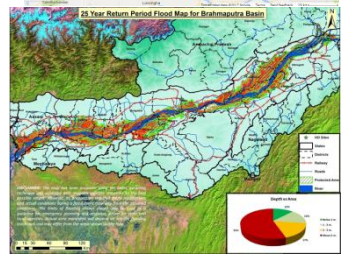
NON-STRUCTURAL MEASURES

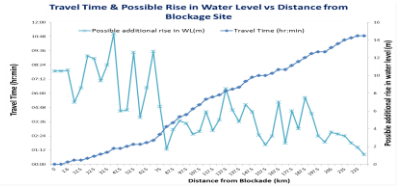
SN	MEASURES	Remarks
1	FLOOD FORECASTING & WARNING	Network of hydro-meteorological stations and real time response models with collected data
2	UNIFIED OPERATIONS OF CONTROL STRUCTURES	DVC model of integrated operation of reservoirs
2	FLOOD PLAIN ZONING	Legislative measures to regulate developmental activities in flood plane zones.
3	FLOOD PROOFING	Raising a few villages above pre-determined flood levels and connecting them to nearby roads or high lands
4	FLOOD INSURANCE	Insurance to protect against the risk of damage to properties caused by floods.
5	INSTITUTIONAL COLLABORATION	SoPs for institutional responsibilities and responses

FLOOD FORECASTING SERVICES

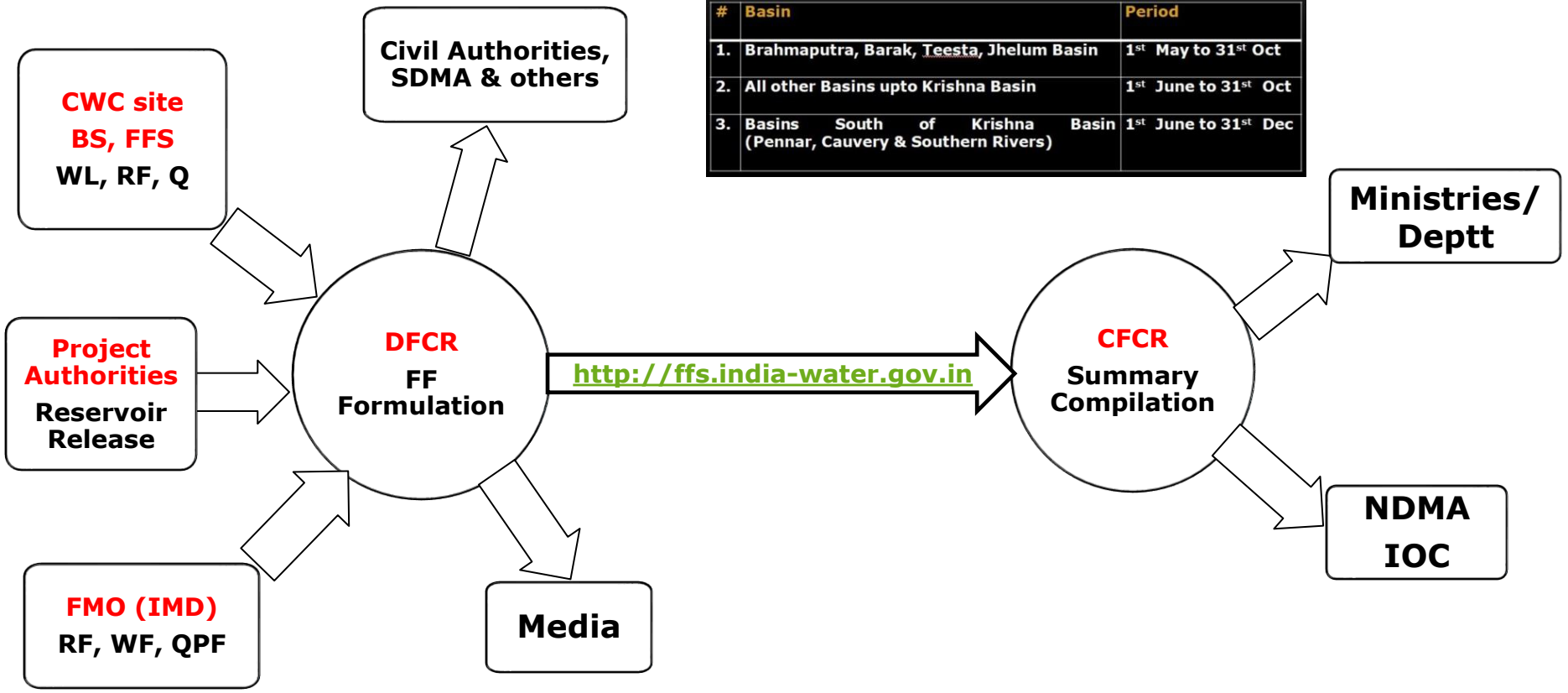
- Estimation of river water level or inflow into reservoirs in advance to alert concerned
- River Water Level Forecast for towns/habitations
- Reservoir Inflow forecast for Reservoir operation
- Inundation Forecast for areas likely to be inundated
- GLOF/Landslide advisory







Flood Forecasting Set up in India



DESIGNATED FLOOD PERIOD FOR DIFFERENT RIVER BASINS

#	Basin	Period
1.	Brahmaputra, Barak, Teesta, Jhelum Basin	1st May to 31st Oct
2.	All other Basins upto Krishna Basin	1st June to 31st Oct
3.	Basins South of Krishna Basin (Pennar, Cauvery & Southern Rivers)	1st June to 31st Dec

Coordination with other Agencies at Regional Level

24X7 Control Room of DoWR, RD & GR (MoJS)

CHALLENGES FOR IFM

- Climate change induced vulnerabilities
- Unplanned development induced challenges
- Multiplicity of operational authorities and inter-agency coordination
- Trans-boundary confidence building
- Resource mobilization challenges

SUMMING UP

- Integrated Flood Management is a wide based concept. Implementation requires collaborative and synergy based approach amongst multiple scientific disciplines, legislative and executive authorities and financial support
- Especially in developing countries, the strategy will essentially be dynamic with course corrections at regular intervals
- For a hydrologically inter-twined region like SAARC, trans boundary cooperation and vulnerability appreciation is strongly recommended.

THANK YOU FOR YOUR ATTENTION