

Annex A – Key Features of the Flood-Resilient Developments (FRD) guidebook

A1. Risk assessment matrix to assess flood risk

Central to the guidebook is a flood risk assessment matrix, which considers both the likelihood and potential impact of flooding. The tool comprises three steps –

Step 1: Determine the flood likelihood based on factors such as the development's ground level, drainage system, and features such as entrances and basements;

Step 2: Determine the flood impact across three aspects — human safety, damage to assets, and operational disruption; and

Step 3: Determine the risk category using a Flood Risk Matrix. The resulting risk category provides a structured basis for identifying and prioritising the appropriate flood management actions.

Step 1 Likelihood Assessment Table

	Outdoor Area			Indoor Area	Basement
Flood Likelihood	■ Development ground level vs. adjacent developments	■ Entrances to development vs. road (Any part of the development boundary that is not walled)	■ Drain capacity and condition (Developments near the coast should observe drains during high tides as well)	■ Building openings (e.g. doors, windows, ventilation openings)	■ Entrance to basement and presence of sump pump
Likely	☐ Development's ground level is lower 	☐ Entrances to development are lower 	☐ Water occasionally overflows from drains 	☐ Building openings are lower 	☐ Entrance to basement is flush with the Outdoor Area and no sump pump
Possible	☐ Development's ground level is roughly the same 	☐ Entrances to development are flush with the adjacent road 	☐ Drains are almost full with stagnation 	☐ Building openings are flush with Outdoor Area 	☐ Entrance to basement is higher, but there is no sump pump or ☐ There is a sump pump, but entrance to basement is flush with the Outdoor Area
Unlikely	☐ Development's ground level is higher 	☐ Entrances to development are higher 	☐ Drains are not full and water flows away quickly 	☐ Building openings are raised 	☐ Entrance to basement is higher with sump pump

Disclaimer: If user is unable to determine answers based on site inspection, available drawings or prior knowledge, the outcome of the flood risk assessment may not be accurate. In such cases, it is recommended to engage a professional for greater assessment accuracy.

*The visual template shown above guides users to assess the likelihood of the development flooding in three areas – outdoors, indoors, and basement
(Credit: PUB)*

A2. Tools to manage flood risks

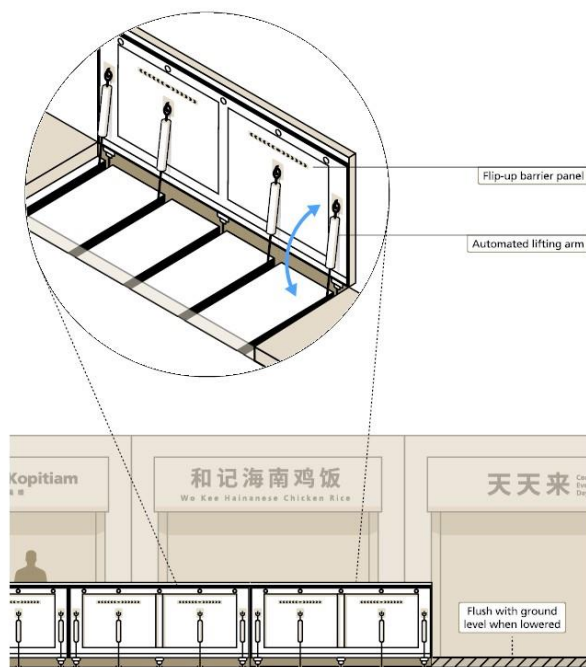
The guidebook also outlines a range of practical measures aimed at flood prevention and damage reduction to help users identify solutions that meet the unique needs and constraints of each development. Preventive measures include different types of flood barriers deployed to keep floodwaters out, while damage reduction measures include waterproof sealants for exterior walls and flooring, as well as mobile pumps. Adopting a combination of measures will enhance resilience and support faster recovery of developments when flooding cannot be fully avoided.

Deployable flood barriers (pre-installed)

Pre-installed flood protection barriers that are activated manually or automatically to prevent floodwater ingress. Common types include slot-in, flip-up, sliding, and hinged barriers.

Measure Type	Flood prevention (Likelihood)
Applicable Area	Outdoor, Indoor, Basement
Capital Cost	Medium
O&M Cost	Medium
Deployment Effort	Medium
Aesthetic Impact	Low

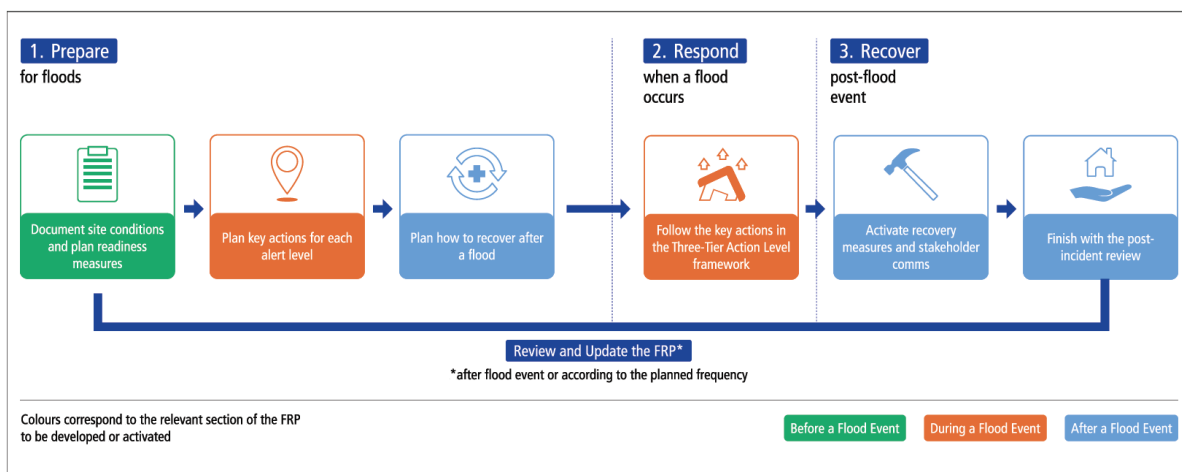
■ Flip-Up Flood Barrier



An excerpt from the FRD guidebook on pre-installed deployable barriers— a flood prevention measure (Credit: PUB)

A3. Flood response plan to enhance preparedness

The guidebook highlights the importance of putting in place a flood response plan. A well-developed flood response plan covers three key phases – prepare, respond and recover. The prepare phase defines roles, responsibilities, and response protocols based on flood risk assessments, sets out recommended drill frequencies, and ensures flood protection measures are properly maintained. The response phase recommends the implementation of a response system, proportionate to the severity of the flood. This includes a communications plan and evacuation procedures covering routes, safe zones, and coordination with emergency services. Finally, the recovery phase outlines procedures for damage assessment, clean-up, and restoration of building elements, systems, and flood-resilient measures to resume operations in a timely manner.



Key components of the flood response plan (Credit: PUB)

There is also a simplified flood safety guide for smaller developments, such as landed homes and shophouses. The flood response plan, together with the flood safety guide for homeowners and shophouses, enable all developments to translate flood awareness into structured response and recovery plans, facilitating timely and coordinated action when flooding occurs.

Flood Safety Guide for Landed Homes and Shophouses

HOW TO PREPARE FOR A FLOOD

Resource Website:
<https://go.gov.sg/flood-safety-tips>



Store important items in high spaces and move your car to high ground.



Plan your evacuation routes. If you are in a multi-storey house or shophouse, the safest place is the highest floor.



Locate the distribution board (DB box) and know how to turn it off.



Check that flood barriers are in good working condition.



Regularly check drainage system to ensure it is well-maintained with no blockages.

WHAT TO DO WHEN A FLOOD IS COMING



Turn off the DB box to prevent electrical short circuits.



Put up flood barriers, if any.



Go to high ground or upper floors. Assist vulnerable individuals to evacuate.



Do not walk or drive through floodwaters.

Stay Informed with Flood Alerts

Telegram Channel



t.me/pubfloodalerts

PUB's Flood Alerts Telegram Channel (@pubfloodalerts) provides updates on heavy rain, locations with flood risk, and more.



myENV App



myENV is a one-stop platform for environment and water services.

Flood Safety Guide for Homeowners and Shophouses (Credit: PUB)