

II-C. Resource challenges

Q6. Based on your personal experience, please indicate the importance of the following resource challenges in flood management in the Mekong delta? Please select the level of importance for each challenge.

G3 - Resource & Capacity challenges	Very important	Important	Neutral	Unimportant	Very unimportant	No answer
C14: Flood management lacks financial resource						
C15: Finance for flood management does not reach relevant regions and actors						
C16: Flood management staffs lack important capacities						
C17: Insufficient number of staffs for flood management						
C18: Lack of data and equipment for flood risk management						
C19: Limited institutional capacities for flood management, e.g. missing legislative instruments						

Q7. Apart from the above mentioned challenges, do you experience any other important flood management challenge(s)?

Open answer:

.....

Q8. In previous questions, you have ranked the following challenges as important or very important. Please select 03 challenges that you think are most important and thus need to be addressed so as to allow for improved flood risk management in the Mekong Delta.

- Challenge 1
- Challenge 2
-
- Challenge n

III. Explore solutions to address flood management challenges

In this section, we ask for your recommendations on solutions to overcome the most important flood management challenges in the Mekong delta.

Q9. In the previous step, you identified [FILL CHALLENGE] as one important flood management challenge. Could you please recommend two specific solutions, preferably with concrete examples, to overcome this challenge?

Open answer:

Solution 1:

.....

Solution 2:

.....

Q10. In the previous step, you identified [FILL CHALLENGE] as one important flood management challenge. Could you please recommend two specific solutions, preferably with concrete examples, to overcome this challenge?

Open answer:

Solution 1:

.....

Solution 2:

.....

Q11. In the previous step, you identified [FILL CHALLENGE] as one important flood management challenge. Could you please recommend two specific solutions, preferably with concrete examples, to overcome this challenge?

Open answer:

Solution 1:

.....

Solution 2:

.....

IV. Explore flood prevention measures

Flood risk can be mitigated through a number of flood prevention measures. In this section, we ask for your opinions on feasible infrastructure measures for flood prevention in the Mekong delta.

Q12. Based on your experience, please indicate which flood prevention measures are more relevant for the Mekong delta?

Flood prevention measures	Very relevant	Relevant	Neutral	Irrelevant	Very irrelevant	No answer
1. Controlled flooding in the Plain of Reeds and Long Xuyen Quadrangle. Agricultural land in these areas could be flooded to protect urbans.						
2. Full flood control for major cities and towns through improving and building new dikes.						
3. Creating retention zones and widen floodplains to store excessive flood water						
4. Improve existing flood water transfer capacity through river dredging, optimizing sluices/gates operation, etc.						
5. Build emergency flood diversion channels from Plain of Reeds and Long Xuyen Quadrangle to West and East Seas.						

Q13. Apart from the above mentioned measures, do you recommend any other infrastructure measures for flood protection in the Mekong delta?

Open answer:

.....

V. Closing session

To finalise this survey, we would like to ask questions about your professional background. We only use the answers for analytical purpose and will only publish aggregated data.

Q14. Which of the below item best describe your occupation? Please select one item from the list below.

1. Government officer
2. Non-governmental organisation
3. Business/company
4. Social scientist
5. Natural scientist
6. Engineer
7. Other:

Q15. At which level is your work most focused on? Please select one item from the list below.

1. International
2. National
3. Regional (e.g. the Mekong delta)
4. Provincial
5. Municipal
6. Other:

Q16. Which of the following aspects of flood is your work most focused on? Please select one item from the list below

1. Flood research
2. Water management and planning
3. Land use management and planning
4. Flood protection infrastructures
5. Building flood resilience, living with flood
6. Climate change adaptation relating to flood
7. Flood early warning and emergency response
8. Other:

Q17. Is flood the most important component of your daily work?

1. Yes
2. No

Q18. What is your age category?

1. < 25 years old
2. 26 – 35 years old
3. 36 – 45 years old
4. 46 – 55 years old
5. 56 – 65 years old
6. > 65 years old

Q19. If you have any further comments/remarks about this questionnaire, please fill in the below lines.

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Q20. You have finished our survey. We thank you very much for filling in the questionnaire!

Please indicate if you wish to receive the result of this survey:

- 1. Yes, please send results to
- 2. No thank you.

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Supplement S2-b: Equations for calculating the flood management challenges' important levels and relating statistics

Aggregated important score

$$S_i = \frac{\sum_{e=1}^{71} S_{e,i}}{N_e} \quad (\text{eq.1})$$

Where

- S_i : Aggregated important score of challenge i ; with $i = 1:19$
 $S_{e,i}$: Important score given by expert e to challenge i ; with $e = 1:71$
 N_e : Total number of expert; $N_e=71$

Group-wise important score

$$S_{i,g} = \frac{\sum_{e=1}^{N_{e,g}} S_{e,i,g}}{N_{e,g}} \quad (\text{eq. 2})$$

Where

- $S_{i,g}$: Aggregated important score of challenge i for expert group g ; with $i = 1:19$. Experts were grouped according to their occupations; spatial working levels and working focus in relation to flood management.
 $S_{e,i,g}$: Important score given by expert e of group g to challenge i
 $N_{e,g}$: Total number of expert in group g

Correlation coefficient between the challenges' ranking scores

$$r_{x,y} = \frac{\sum_{i=1}^n (X_i - X)(Y_i - Y)}{\sqrt{\sum_{i=1}^n (X_i - X)^2} \sqrt{\sum_{i=1}^n (Y_i - Y)^2}} \quad (\text{eq.3})$$

Where

- $r_{x,y}$: Person correlation coefficient between important scores of challenge x and y
 X_i : Individual experts' scores for challenge x
 Y_i : Individual experts' scores for challenge y
 X : Average experts' score for challenge x
 Y : Average experts' score for challenge y
 n : Total numbers of scores given to each challenge; $n=71$

Supplement S2-c: Correlation coefficients between the challenge's rankings

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16	C17	C18	C19	
C1	1	0.02	0.21	0.12	0.12	-0.1	-0.09	0.09	-0	0.08	0.34**	0.02	0.17	-0	0.03	0.2	0.15	0.27*	0.04	
C2		1	0.1	0.03	0.04	0.14	0	0.01	0.15	0.26*	0.28*	0.08	0.1	0.09	0.29*	0.03	-0.01	0.14	0.15	
C3			1	0.09	0.2	0.26*	0.07	0.06	-0.1	-0.1	0.19	0	0.2	0.3*	0.18	0.28*	0.31**	0.29*	0.16	
C4				1	0.17	0.03	0.02	-0	0.09	0.13	0.13	0.16	0.05	0	-0.1	-0.09	-0.11	0.12	0.06	
C5					1	0.22	0.42**	0.07	0.29*	0.2	0.25*	0.35**	0.29*	-0	0.18	0.32**	0.2	0.38**	0.17	
C6						1	0.46**	-0.1	0.19	0.12	0.16	0.17	0.01	0.2	0.17	0.12	0.04	0.33**	0.4**	
C7							1	0.21	0.25*	0.13	0.19	0.04	0.26*	0.1	-0.1	0.3*	0.11	0.32**	0.29*	
C8								1	-0.1	-0.04	0.12	0.19	0.33**	-0	-0	0.13	0.18	0.05	-0.07	
C9									1	0.54**	0.35**	0.12	0.24*	0	0.26*	0.08	0.07	0.22	0.26*	
C10										1	0.4**	0.12	0.18	0.01	0.38**	0.08	0.2	0.3	0.19	
C11											1	0.13	0.13	0.18	0.2	0.32**	0.34**	0.44**	0.24*	
C12												1	0.12	-0	0.08	-0.05	0.14	0.05	-0.05	
C13													1	0.01	0.14	0.27*	0.13	0.21	0.23	
C14														1	0.21	0.28*	0.47**	0.23	0.18	
C15															1	0.29*	0.2	0.23	0.32**	
C16																1	0.63**	0.42**	0.21	
C17																	1	0.35**	0.24*	
C18																		1	0.46**	
C19																				1

*: Significant correlation at 0.95 confident level

** : Significant correlation at 0.99 confident level

Supplementary Material S3: Flood management solutions and strategies

Supplementary material S3-a: Inventory of the solutions to address flood management challenges

ID	Solutions	Recommendation frequency	Thematic strategy
1	Promote exchange and learning	24	Forster cross-boundary interactions
2	Implement integrated flood impact assessment	22	Improve data and decision support
3	Improve collaboration between actors	21	Forster cross-boundary interactions
4	Build capacity for flood management staff	21	Improve capacity and resources
5	Develop new technical measures	19	Innovate and shift flood management approaches
6	Improve communication	19	Forster cross-boundary interactions
7	Improve data sharing	16	Forster cross-boundary interactions
8	Improve collaboration between regions	15	Forster cross-boundary interactions
9	Revise existing measures	14	Strengthen and diversify the flood management portfolio
10	Improve human resources capacity	11	Improve capacity and resources
11	Promote participatory approach	11	Create an enabling environment for flood management
12	Promote integrated management	10	Strengthen and diversify the flood management portfolio
13	Develop new legislation	9	Create an enabling environment for flood management
14	Develop coordinating board	9	Create an enabling environment for flood management
15	Improve monitoring and early warning	9	Improve data and decision support
16	Shift thinking and management paradigm	8	Innovate and shift flood management approaches
17	Improve data's accuracy	8	Improve data and decision support
18	Improve coordination between regions	8	Create an enabling environment for flood management
19	Match expertise with problem	7	Improve capacity and resources
20	Generate funding from international collaboration	7	Improve capacity and resources
21	Improve institutional capacity	6	Improve capacity and resources
22	Improve coordination within region	6	Create an enabling environment for flood management
23	Develop agreements between regions	6	Create an enabling environment for flood management
24	Promote multi-objective flood management	6	Strengthen and diversify the flood management portfolio
25	Localize flood management	6	Strengthen and diversify the flood management portfolio
26	Set priorities in management	6	Strengthen and diversify the flood management portfolio

27	Improve flood modelling	5	Improve data and decision support
28	Generate funding from state budget	5	Improve capacity and resources
29	Diversify funding sources	5	Improve capacity and resources
30	Centralize flood management	5	Strengthen and diversify the flood management portfolio
31	Develop flood monitoring system	5	Improve data and decision support
32	Account for local conditions and resources	5	Improve capacity and resources
33	Invest in equipment	4	Improve capacity and resources
34	Develop education programs	4	Improve capacity and resources
35	Address unwanted impacts of existing measures	4	Strengthen and diversify the flood management portfolio
36	Enforce existing legislation	4	Create an enabling environment for flood management
37	Explore flood benefits	4	Strengthen and diversify the flood management portfolio
38	Synchronize flood monitoring, forecast and decision making	4	Improve data and decision support
39	Support stakeholders negotiation	4	Create an enabling environment for flood management
40	Adapt current policies	4	Innovate and shift flood management approaches
41	Resolve conflicts	4	Create an enabling environment for flood management
42	Promote integrated planning	4	Strengthen and diversify the flood management portfolio
43	Collect more data	4	Improve data and decision support
44	Test measures	4	Improve data and decision support
45	Develop visions	4	Strengthen and diversify the flood management portfolio
46	Improve coordination between actors	3	Create an enabling environment for flood management
47	Develop flood control system	3	Strengthen and diversify the flood management portfolio
48	Improve investment	3	Improve capacity and resources
49	Integrate multiple measures	3	Strengthen and diversify the flood management portfolio
50	Increase project funding	3	Improve capacity and resources
51	Develop adaptive measures	3	Strengthen and diversify the flood management portfolio
52	Publish research results	3	Improve data and decision support
53	Apply local knowledge in management	3	Strengthen and diversify the flood management portfolio
54	Compensate for negative management impacts	3	Strengthen and diversify the flood management portfolio
55	Improve training and education	3	Improve capacity and resources
56	Promote applied researches	2	Improve data and decision support

57	Promote flood-resilient development	2	Strengthen and diversify the flood management portfolio
58	Develop international agreements	2	Create an enabling environment for flood management
59	Optimize existing control infrastructures	2	Strengthen and diversify the flood management portfolio
60	Promote multi-level management	2	Strengthen and diversify the flood management portfolio
61	Improve planning	2	Strengthen and diversify the flood management portfolio
62	Raise awareness	2	Improve capacity and resources
63	Develop no-regret measures	2	Strengthen and diversify the flood management portfolio
64	Build bottom-up organisations	2	Strengthen and diversify the flood management portfolio
65	Localize flood research	2	Strengthen and diversify the flood management portfolio
66	Improve employment conditions	2	Improve capacity and resources
67	Improve transparency in management	2	Create an enabling environment for flood management
68	Establish flood research organisation	2	Improve data and decision support
69	Establish multi-stakeholder platform	2	Create an enabling environment for flood management
70	Develop alternative livelihoods	2	Innovate and shift flood management approaches
71	Improve data accessibility	2	Improve data and decision support
72	Adopt scenario-based planning	1	Strengthen and diversify the flood management portfolio
73	Apply international standards	1	Create an enabling environment for flood management
74	Avoid ineffective investment	1	Improve capacity and resources
75	Assess impacts of flood management	1	Improve data and decision support
76	Avoid technological lock-in	1	Strengthen and diversify the flood management portfolio
77	Develop early warning systems	1	Improve data and decision support
78	Create common understanding	1	Create an enabling environment for flood management
79	Develop data and information system	1	Improve data and decision support
80	Develop decision support system	1	Improve data and decision support
81	Combine forecast with indigenous knowledge	1	Improve data and decision support
82	Clarify responsibilities	1	Create an enabling environment for flood management
83	Compare measures	1	Improve data and decision support
84	Combine grant and loan in funding	1	Improve capacity and resources
85	Promote intermediary organisations	1	Forster cross-boundary interactions
86	Monitor implementation process	1	Improve data and decision support
87	Provide information to local level	1	Forster cross-boundary interactions

88	Provide demos and examples for proposed measures	1	Improve data and decision support
89	Match flood management with other objectives	1	Strengthen and diversify the flood management portfolio
90	Integrate multiple data sources	1	Improve data and decision support
91	Mitigate climate change	1	Strengthen and diversify the flood management portfolio
92	Match measures with available resources	1	Improve capacity and resources
93	Reduce population pressure	1	Strengthen and diversify the flood management portfolio
94	Set protection level	1	Strengthen and diversify the flood management portfolio
95	Set priorities in funding	1	Improve capacity and resources
96	Upgrade and maintain existing infrastructures	1	Strengthen and diversify the flood management portfolio
97	Shift power balance between actors	1	Create an enabling environment for flood management
98	Separate flood management from other objectives	1	Innovate and shift flood management approaches
99	Remove institutional barriers	1	Create an enabling environment for flood management
100	Set priorities for most vulnerable regions	1	Strengthen and diversify the flood management portfolio
101	Separate technical and managerial training	1	Innovate and shift flood management approaches
102	Implement and enforce existing plans	1	Strengthen and diversify the flood management portfolio
103	Improve flood emergency responses	1	Strengthen and diversify the flood management portfolio
104	Improve financial resources	1	Improve capacity and resources
105	Identify knowledge demands	1	Improve data and decision support
106	Focus research on basin-wide issues	1	Improve data and decision support
107	Evaluate quality of research results	1	Improve data and decision support
108	Focus training and education on the junior staff	1	Improve capacity and resources
109	Focus research on local issues	1	Improve data and decision support
110	Improve research funding	1	Improve capacity and resources
111	Improve measures applicability	1	Strengthen and diversify the flood management portfolio
112	Improve knowledge uptake	1	Improve data and decision support
113	Improve independence of legal institutions	1	Create an enabling environment for flood management
114	Improve recruitment	1	Improve capacity and resources

Supplementary material S3-b: Flood management strategies and associated solutions

Strategy S1: Create an enabling environment for flood management

Member solutions	Recommendation frequency	Solution ID
Promote participatory approach	11	11
Develop new legislation	9	13
Develop coordinating board	9	14
Improve coordination between regions	8	18
Improve coordination within region	6	22
Develop agreements between regions	6	23
Enforce existing legislation	4	36
Support stakeholders negotiation	4	39
Resolve conflicts	4	41
Improve coordination between actors	3	46
Develop international agreements	2	58
Improve transparency in management	2	67
Establish multi-stakeholder platform	2	69
Apply international standards	1	73
Create common understanding	1	78
Clarify responsibilities	1	82
Shift power balance between actors	1	97
Remove institutional barriers	1	99
Improve independence of legal institutions	1	113

Strategy S2: Strengthen and diversify the flood management portfolio

Member solutions	Recommendation frequency	Solution ID
Revise existing measures	14	9
Promote integrated management	10	12
Promote multi-objective flood management	6	24
Localize flood management	6	25
Set priorities in management	6	26
Centralize flood management	5	30
Address unwanted impacts of existing measures	4	35
Explore flood benefits	4	37
Promote integrated planning	4	42
Develop visions	4	45
Develop flood control system	3	47
Integrate multiple measures	3	49
Develop adaptive measures	3	51
Apply local knowledge in management	3	53
Compensate for negative management impacts	3	54
Promote flood-resilient development	2	57
Optimize existing control infrastructures	2	59

Promote multi-level management	2	60
Improve planning	2	61
Develop no-regret measures	2	63
Build bottom-up organisations	2	64
Localize flood research	2	65
Adopt scenario-based planning	1	72
Avoid technological lock-in	1	76
Match flood management with other objectives	1	89
Mitigate climate change	1	91
Reduce population pressure	1	93
Set protection level	1	94
Upgrade and maintain existing infrastructures	1	96
Set priorities for most vulnerable regions	1	100
Implement and enforce existing plans	1	102
Improve flood emergency responses	1	103
Improve measures applicability	1	111

Strategy S3: Forster cross-boundary interactions

Member solutions	Recommendation frequency	Solution ID
Promote exchange and learning	24	1
Improve collaboration between actors	21	3
Improve communication	19	6
Improve data sharing	16	7
Improve collaboration between regions	15	8
Promote intermediary organisations	1	85
Provide information to local level	1	87

Strategy S4: Improve capacity and resources

Member solutions	Recommendation frequency	Solution ID
Build capacity for flood management staff	21	4
Improve human resources capacity	11	10
Match expertise with problem	7	19
Generate funding from international collaboration	7	20
Improve institutional capacity	6	21
Generate funding from state budget	5	28
Diversify funding sources	5	29
Account for local conditions and resources	5	32
Invest in equipment	4	33
Develop education programs	4	34
Improve investment	3	48
Increase project funding	3	50
Improve training and education	3	55
Raise awareness	2	62
Improve employment conditions	2	66

Avoid ineffective investment	1	74
Combine grant and loan in funding	1	84
Match measures with available resources	1	92
Set priorities in funding	1	95
Improve financial resources	1	104
Focus training and education on the junior staff	1	108
Improve research funding	1	110
Improve recruitment	1	114

Strategy S5: Improve data and decision support

Member solutions	Recommendation frequency	Solution ID
Implement integrated flood impact assessment	22	2
Improve monitoring and early warning	9	15
Improve data's accuracy	8	17
Improve flood modelling	5	27
Develop flood monitoring system	5	31
Synchronize flood monitoring, forecast and decision making	4	38
Collect more data	4	43
Test measures	4	44
Publish research results	3	52
Promote applied researches	2	56
Establish flood research organisation	2	68
Improve data accessibility	2	71
Assess impacts of flood management	1	75
Develop early warning systems	1	77
Develop data and information system	1	79
Develop decision support system	1	80
Combine forecast with indigenous knowledge	1	81
Compare measures	1	83
Monitor implementation process	1	86
Provide demos and examples for proposed measures	1	88
Integrate multiple data sources	1	90
Identify knowledge demands	1	105
Focus research on basin-wide issues	1	106
Evaluate quality of research results	1	107
Focus research on local issues	1	109
Improve knowledge uptake	1	112

Strategy 6: Innovate and shift approaches

Member solutions	Recommendation frequency	Solution ID
Develop new technical measures	19	5
Shift thinking and management paradigm	8	16
Adapt current policies	4	40
Develop alternative livelihoods	2	70
Separate flood management from other objectives	1	98
Separate technical and managerial training	1	101