



How can we compromise despite conflicts between economic recovery and life reconstruction in the aftermath of disasters?

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- 自然災害に関する総合防災学の共同利用・共同研究拠点 -

Background

We are promoting a research project for earlier economic recovery from a large-scale disaster in Aichi prefecture, Japan. Aichi is the most industrialized prefecture in Japan. There is TOYOTA one of the largest automobile manufacturing company in the world.

- High risk of earthquake.
(Nankai-Trough Earthquake, 70~80% in 30years, M8~9)
- Industry delivery amount of Aichi in 2018 was around 460 billion dollars.
- Strong needs for earlier economic recovery.



Background

It is important to promote earlier recovery of economy, especially in a highly industrialized area. On the other hand, life reconstruction (i.e. recovery of water, electricity, gas and houses) is also necessary. Under a constraint of resources for recovery, how should we achieve a better way of recovery process?

A case from The Niigataken Chuetsu-oki Earthquake in 2007

- A manufacturing company (Riken Corporation:株式会社リケン) producing an important part of engines (piston rings) was damaged by this earthquake.
- Water is essential for the production of piston rings, but water suspension occurred by this earthquake. The waterworks bureau in the city decided to put priority on the water recovery for Riken corporation even though at the situation that many people were still suffering from water suspension.
- In this city, this decision was accepted. Many people work for the company, so there was not much backlash due to this decision. What if the same kind of decision was made in other cities? Is there a risk of much backlash?

A questionnaire survey to residents in Aichi

We have conducted a questionnaire survey in Aichi prefecture via internet. In the survey, we focused on conflicts between economic recovery and life reconstruction.

Survey preparation process

Date	Actions
Aug.– Dec., 2019	Literature reviews on economic recovery and life reconstruction Discussions on disaster recovery with stakeholders in Aichi prefecture (manufacturing companies, lifeline companies and governments)
Jan.–Apr., 2020	Planning of the survey, making the questionnaire, collection of conflicts in past disasters
Apr., 2020	A pre-preliminary survey (7 respondents)
May.-Jun., 2020	Elaboration of the questionnaire
Jun. 22–30, 2020	A preliminary survey (53 respondents)
Jul.-Aug., 2020	Further elaboration of the questionnaire
Aug. 21–24, 2020	Main survey(750 respondents via internet)

Outline of the survey

In the survey, we presented a hypothetical scenario of disaster (Nankai-Trough Earthquake) and respondents were asked to choose an appropriate time to start various kinds of social activities (we prepared 32 kinds of activities).

Questionnaire

Question sentence :

When do you think is appropriate to do those social activities below if you consider the presented hypothetical disaster scenario. Please guess people's answer and check the appropriate time. In case you think it's appropriate but you think people won't think it's appropriate, please assume it's "not" appropriate yet.

(The original text in Japanese : 以下のことは、世間の「空気感」に照らしたとき、災害発生後、いつ頃からなら許される風潮になると思いますか？今回想定した災害シナリオを踏まえたうえで、各項目について、その時点からなら許されると思うタイミングに1つだけチェックしてください。なお、あなた個人としては許されると思うが、実際にそれを行うとなると世間が許さないだろうと思う場合は、「許されない」として回答してください。)

social activities	Right after the earthquake 発災直後でも許される	One week after the earthquake 1週間後からなら許される	One month after the earthquake 1ヶ月後からなら許される	Three months after the earthquake 3ヶ月後からなら許される	Six months after the earthquake 6ヶ月後からなら許される	More than six months after the earthquake 6ヶ月後でも許されない
Broadcasting comedy show on TV	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Starting sightseeing campaign (for damaged areas)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
...

The hypothetical scenario of the disaster

6月
5日
20XX年

発災直後



- Right after the earthquake
 - M9 earthquake and huge tsunami (the JMA Seismic Intensity Scale was 7)
 - severe damage to wooden houses
 - electricity, gas and water supply stopped

6月
12日
20XX年

1週間後



- One week after the earthquake
 - the aftershocks are continuing
 - many people are in shelters
 - insufficient food supply

7月
5日
20XX年

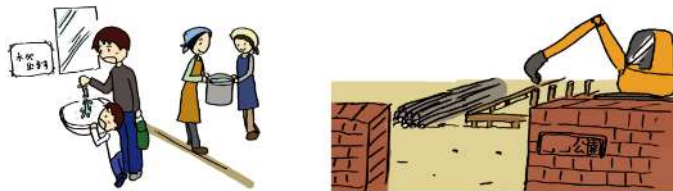
1か月後



- One month after the earthquake
 - electricity and internet are recovered
 - water and gas are still in suspension
 - accumulated fatigue of life in shelters
 - some supermarkets and highways are available

9月
5日
20XX年

3か月後



- Three months after the earthquake
 - water and gas supply are recovered
 - Tōkaidō San'yō Shinkansen is recovered
 - temporary houses are under construction

12月
5日
20XX年

半年後



- Six months after the earthquake
 - moving to temporary housing is completed
 - local companies still have economic damage
 - aggregate demand in Japan is gradually recovering

32 kinds of social activities in the survey (1/2)

Economy related activities

(The original texts in Japanese)

Broadcasting commercial message on TV	企業が自社製品をPRするテレビCMを再開する
Submitting a letter of request on support for economic recovery to governments	地域の経済団体が、産業復興支援の要望書を行政に提出する
Starting sightseeing campaign (for damaged areas)	被災地復興のための観光キャンペーンを開始する
Giving a water recovery priority to an economically important area	地域経済にとって重要な工場の早期再開のために、そのエリアの水道を優先的に復旧する
Asking for a quick recovery of roads to a company's site by a major company in the area	地域の有力企業が、自社の拠点につながる道路の早期復旧を行政に要望する
Prime minister's direction of support for quick restart of automobile exports	内閣総理大臣が、自動車輸出の早期再開を支援するようとの指示を出す
Volunteer centers begin to help not only damaged houses but also damaged companies	災害ボランティアを、被災した住宅の片付けに加えて、被災した企業の事業所の片付けにも派遣するようになる
Restarting pachinko parlors	県内のパチンコ店が営業を再開する
Finishing free distributions of food and living goods in shelters	避難所での食料や生活用品の無料配布を終了する
Local governments reduce the number of officers for shelters and residents to shift them to economic recovery support	避難所や被災者対応の役所職員を減らし、企業の復旧支援の業務に充てる
A major company in the area begins business with a company in another area instead of a local company for earlier recovery	地域の主要企業が、操業の早期再開のため、地元の下請け企業との取引をやめ、県外の企業と取引する決断をする
A major company's decision of leaving damaged area for earlier recovery	地域経済を支えていた主要な企業が県外に移転する決断をする
A manufacturing company asks all employees to work for the company	県内の企業（製造業）が自由出社としていたものを原則全員出社に変更する
Car sellers performing an event for self promotion	県内の自動車販売店がにぎやかな店頭イベントを開催する
Having a professional baseball game in a damaged area	県内でプロ野球の試合を開催する
Having a large scale reassignment in a company	地域の大企業が、転勤を伴う大規模な人事異動を実施する
Restarting construction of a liner central Shinkansen	リニア中央新幹線の工事を再開する

32 kinds of social activities in the survey (2/2)

Other activities

A famous person uploads photos of his or her gorgeous birthday party to SNS
Broadcasting a TV program about “Tokyo can be hit by next earthquake”
Prime minister’s business trip to foreign countries
Closing small shelters and asking people to move to a larger one
Asking people in classroom shelters to move to a gym shelter to restart school
Having an election of members of the prefectural assembly
Having a workshop to make city’s reconstruction plan
Interviews to affected people to get lessons of from the disaster
Ending of gathering garbage as disaster related one
Ending of relief of food supply and bathing by defense force
Local governments put an alert for typhoon and heavy rains on their public relations magazine
Broadcasting comedy show on TV
Having a charity music festival to cheer up damaged people
Reducing the number of people working for finding lost people
Finalizing making city’s reconstruction plan

(The original texts in Japanese)

有名人が個人のSNSに、にぎやかな誕生日パーティの写真をアップする
東京のテレビ番組で「もし次の大地震が東京で起こったら？」という議論をする
内閣総理大臣が公務で海外渡航する
小規模な避難所を閉鎖し、他の避難所に集約する
学校再開のため、教室内の避難者に体育館へ移動してもらう
県議会議員の選挙を実施する
復興まちづくり計画を作成するための住民ワークショップを行う
災害の教訓を後世に伝えるため被災者対象のインタビュー調査を行う
県内の自治体が災害廃棄物の受け入れを終了する
自衛隊による県内での給食・入浴支援を終了する
自治体が、風水害への注意を呼びかける記事を広報誌に掲載する
テレビでバラエティー番組の放送を再開する
被災者を応援するチャリティ音楽イベントを開催する
行方不明者を捜索する人員体制の縮小を開始する
復興まちづくりの都市計画を決定する

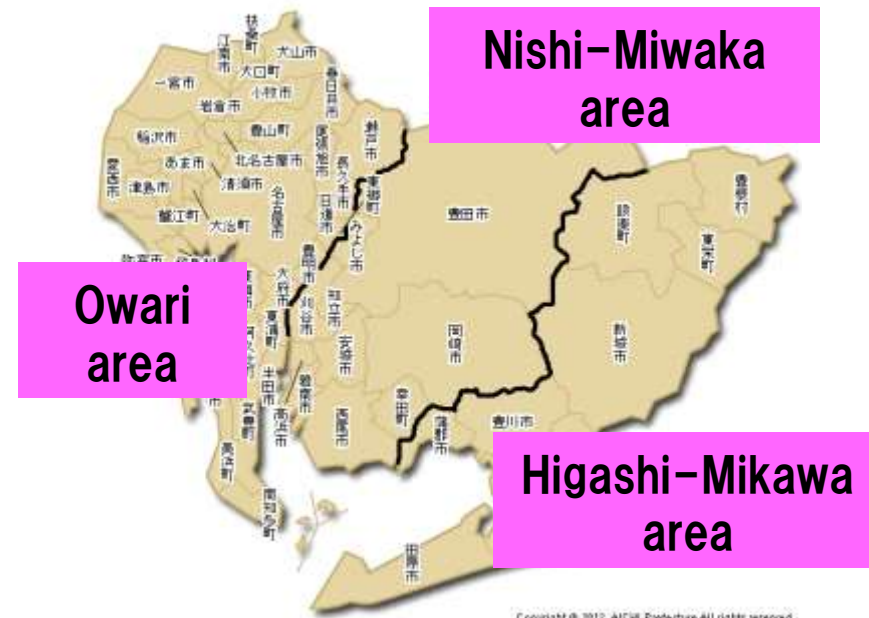
Result of the survey : the number of respondents

address and occupation

	Owari	Nishi-Miwaka	Higashi-Mikawa	total
public employees	50	50	50	150
company employees	100	100	100	300
others	100	100	100	300
total	250	250	250	750

We want know whether there are differences by respondents' addresses and occupations.

< A map of Aichi prefecture >



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age

-19	20-29	30-39	40-49	50-59	60-69	70-79	80-	total
2	73	145	205	188	109	27	1	750

sex

male	female	others	total
497	251	2	750

Result of the survey : mode

	1	2	3	4	5	6	Total	Mode
	Right after	One week	One month	Three months	Six months	More than six months		
Broadcasting commercial message on TV	209	98	183	126	87	47	750	1
A famous person uploads photos of his or her gorgeous birthday party to SNS	118	48	139	128	148	169	750	6
Giving a water recovery priority to an economically important area	256	135	172	100	54	33	750	1
Closing small shelters and asking people to move to a larger one	137	92	168	172	126	55	750	4
A manufacturing company asks all employees to work for a company	104	83	169	171	154	69	750	4
Asking for a quick recovery of roads to a company's site by a major company in the area	173	104	178	131	110	54	750	3
Prime minister's business trip to foreign countries	96	64	168	142	158	122	750	3
Restarting pachinko parlors	99	58	118	126	158	191	750	6
Local governments reduce the number of officers for shelters and residents to shift them to economic recovery support	129	73	162	170	156	60	750	4
Asking people in classroom shelters to move to a gym shelter to restart school	96	98	211	201	111	33	750	3
Starting sightseeing campaign (for damaged areas)	78	46	99	150	238	139	750	5
Having a workshop to make city's reconstruction plan	85	50	148	192	209	66	750	5
A major company in the area begins business with a company in another area instead of a local company for earlier recovery	111	62	159	158	142	118	750	3
Ending of gathering garbage as disaster related one	91	38	85	103	176	257	750	6
Broadcasting a TV program about "Tokyo can be hit by next earthquake"	126	58	144	133	171	118	750	5
Having a professional baseball game in a damaged area	87	47	158	149	192	117	750	5
Prime minister's direction of support for quick restart of automobile exports	125	67	183	169	142	64	750	3
Local governments put an alert for typhoon and heavy rains on their public relations magazine	260	98	188	109	65	30	750	1
Ending of relief of food supply and bathing by defense force	110	34	123	200				
Submitting a letter of request on support for economic recovery to governments	168	92	179	170	114			
Interview to damaged people to get lessons of disaster	98	76	163	150	193			
Performing a event by car sellers for promotion	73	42	127	147	217			
Volunteer centers begin to help not only damaged houses but also damaged companies	161	121	177	137	114			
Having a election of members of the prefectural assembly	65	36	102	163	215			
A major company's decision of leaving damaged area for earlier recovery	106	51	122	135	175			
Finishing free distributions of food and living goods in shelters	59	53	117	157	227			
Broadcasting comedy show on TV	128	110	176	162	130			
Having a large scale reassignment in a company	69	44	137	172	197			
Having a charity music festival to cheer up damaged people	108	87	202	161	151			
Finalizing making city's reconstruction plan	105	66	147	188	197			
Reducing the number of people working for finding lost people	57	35	132	138	232			
Restarting construction of a liner central Shinkansen	90	57	107	134	222			

The distribution of the modes

	all	economic	other
Right after	3	2	1
One week	0	0	0
One month	9	5	4
Three months	4	2	2
Six months	13	7	6
More than six months	3	1	2
total	32	17	15

Some activities are thought to be appropriate at earlier time and others are at later time. 10

Result of the survey : accumulated percentage of the answers of “appropriate”

		1	2	3	4	5	6	percentile				
		Right afte	One week	One mont	Three moi	Six month	More than six	25%	50%	75%	group	mode
E	Giving a water recovery priority to an economically important area	34.1%	52.1%	75.1%	88.4%	95.6%	100.0%	1	2	3	A(1,2,3)	1
E	Broadcasting commercial message on TV	27.9%	40.9%	65.3%	82.1%	93.7%	100.0%	1	3	4	B(1,3,4)	1
	Local governments put an alert for typhoon and heavy rains on their public relations magazine	34.7%	47.7%	72.8%	87.3%	96.0%	100.0%	1	3	4	B(1,3,4)	1
	Closing small shelters and asking people to move to a larger one	18.3%	30.5%	52.9%	75.9%	92.7%	100.0%	2	3	4	C(2,3,4)	3
E	Asking for a quick recovery of roads to a company's site by a major company in the area	23.1%	36.9%	60.7%	78.1%	92.8%	100.0%	2	3	4	C(2,3,4)	3
	Asking people in classroom shelters to move to a gym shelter to restart school	12.8%	25.9%	54.0%	80.8%	95.6%	100.0%	2	3	4	C(2,3,4)	3
E	Volunteer centers begin to help not only damaged houses but also damaged companies	21.5%	37.6%	61.2%	79.5%	94.7%	100.0%	2	3	4	C(2,3,4)	3
	Broadcasting comedy show on TV	17.1%	31.7%	55.2%	76.8%	94.1%	100.0%	2	3	4	C(2,3,4)	3
E	Submitting a letter of request on support for economic recovery to governments	22.4%	34.7%	58.5%	81.2%	96.4%	100.0%	2	3	4	C(2,3,4)	3
E	Prime minister's direction of support for quick restart of automobile exports	16.7%	25.6%	50.0%	72.5%	91.5%	100.0%	2	3	5	D(2,3,5)	3
	Having a charity music festival to cheer up damaged people	14.4%	26.0%	52.9%	74.4%	94.5%	100.0%	2	3	5	D(2,3,5)	3
E	Local governments reduce the number of officers for shelters and residents to shift them to economic recovery support	17.2%	26.9%	48.5%	71.2%	92.0%	100.0%	2	4	5	E(2,4,5)	3
	A famous person uploads photos of his or her gorgeous birthday party to SNS	15.7%	22.1%	40.7%	57.7%	77.5%	100.0%	3	4	5	F(3,4,5)	4
E	A manufacturing company asks all employees to work for a company	13.9%	24.9%	47.5%	70.3%	90.8%	100.0%	3	4	5	F(3,4,5)	4
	Prime minister's business trip to foreign countries	12.8%	21.3%	43.7%	62.7%	83.7%	100.0%	3	4	5	F(3,4,5)	4
	Having a workshop to make city's reconstruction plan	11.3%	18.0%	37.7%	63.3%	91.2%	100.0%	3	4	5	F(3,4,5)	4
E	A major company in the area begins business with a company in another area instead of a local company for earlier recovery	14.8%	23.1%	44.3%	65.3%	84.3%	100.0%	3	4	5	F(3,4,5)	5
	Broadcasting a TV program about "Tokyo can be hit by next earthquake"	16.8%	24.5%	43.7%	61.5%	84.3%	100.0%	3	4	5	F(3,4,5)	5
E	Having a professional baseball game in a damaged area	11.6%	17.9%	38.9%	58.8%	84.4%	100.0%	3	4	5	F(3,4,5)	5
	Ending of relief of food supply and bathing by defense force	14.7%	19.2%	35.6%	62.3%	87.1%	100.0%	3	4	5	F(3,4,5)	5
	Interview to damaged people to get lessons of disaster	13.1%	23.2%	44.9%	64.9%	90.7%	100.0%	3	4	5	F(3,4,5)	5
E	Performing a event by car sellers for promotion	9.7%	15.3%	32.3%	51.9%	80.8%	100.0%	3	4	5	F(3,4,5)	5
E	A major company's decision of leaving damaged area for earlier recovery	14.1%	20.9%	37.2%	55.2%	78.5%	100.0%	3	4	5	F(3,4,5)	5
E	Finishing free distributions of food and living goods in shelters	7.9%	14.9%	30.5%	51.5%	81.7%	100.0%	3	4	5	F(3,4,5)	5
E	Having a large scale reassignment in a company	9.2%	15.1%	33.3%	56.3%	82.5%	100.0%	3	4	5	F(3,4,5)	5
	Finalizing making city's reconstruction plan	14.0%	22.8%	42.4%	67.5%	93.7%	100.0%	3	4	5	F(3,4,5)	5
E	Restarting construction of a liner central Shinkansen	12.0%	19.6%	33.9%	51.7%	81.3%	100.0%	3	4	5	F(3,4,5)	5
E	Restarting pachinko parlors	13.2%	20.9%	36.7%	53.5%	74.5%	100.0%	3	4	6	G(3,4,6)	5
E	Starting sightseeing campaign (for damaged areas)	10.4%	16.5%	29.7%	49.7%	81.5%	100.0%	3	5	5	H(3,5,5)	5
	Having a election of members of the prefectural assembly	8.7%	13.5%	27.1%	48.8%	77.5%	100.0%	3	5	5	H(3,5,5)	6
	Reducing the number of people working for finding lost people	7.6%	12.3%	29.9%	48.3%	79.2%	100.0%	3	5	5	H(3,5,5)	6
	Ending of gathering garbage as disaster related one	12.1%	17.2%	28.5%	42.3%	65.7%	100.0%	3	5	6	I(3,5,6)	6

groups by accumulated percentage and modes are generally corelated

Result of the survey : χ^2 test (1/2)

an example

Broadcasting commercial message on TV						p=	0.065999
	Right after	One week	One month	Three mont	Six months	More than six months	
Owari	70	25	67	37	32	19	
Nishi-Mikawa	77	34	57	49	26	7	

the number of the activities that statistically significant difference between groups was found

groups		p<0.1	p<0.05	p<0.01
address	Owari and Nishi-Mikawa	6	3	1
	Owari and Higashi-Mikawa	7	5	1
	Nishi-Mikawa and Higashi-Mikawa	6	4	0
	three groups	6	3	1
occupation	public employees and company employees	1	1	0
	public employees and others	22	16	7
	company employees and others	15	12	7
	three groups	19	14	5
age (-59, 60-)		8	2	1
sex		24	21	12
income	-5million yen and 5-10million yen	2	2	0
	-5million yen and 10- million yen	3	1	0
	5-10 million yen and 10- million yen	4	4	0
	three groups	2	1	1
living with infants or elders and not living wtih		2	2	0

Result of the survey : χ^2 test (2/2)

Question sentence :

When do you think is appropriate to do those social activities below if you consider the presented hypothetical disaster scenario. Please guess people's answer and check the appropriate time. In case you think it's appropriate but you think people won't think it's appropriate, please assume it's "not" appropriate yet.

- In the question sentence, we asked respondents to guess the people's (in Japanese "世間の") answer. In the end of the questionnaire, we asked what kind of people you mainly imagined.
- The answers were distributed as below.
 - all people in Japan 213 ·people in all damaged areas 334
 - people in Aichi prefecture 118 ·people close to you 80 ·others 5
- We did χ^2 test based on the groups made by this answer.

the number of the activities that statistically significant difference between groups was found

	groups	p<0.1	p<0.05	p<0.01
people mainly imagined	all Japan and all damaged areas	32	32	31
	all Japan and Aichi+close	31	31	25
	all damaged areas and Aichi+close	2	1	0
	three groups	32	32	29

The answers differs a lot depending on the people that the respondent imagined. (We found company officers and -59 years old people tend to answer "all Japan")

Result of the survey : which group answers earlier time? (1/2)

- We want to know which group tends to answer earlier time and which group tends to answer later time.
- We analyzed which group had already answered “appropriate” more at each time on the scenario.

the accumulated percentage of the answers of “appropriate” and the differences between two groups

Broadcasting commercial message on TV							
	Right after	1 week	1 month	3 months	6 months	More than 6 months	
all Japan(A)	34.3%	50.2%	69.5%	83.6%	92.0%	100.0%	
all damaged areas(B)	24.0%	35.9%	61.1%	80.5%	95.2%	100.0%	
A-B	10.3%	14.3%	8.4%	3.0%	-3.2%	0.0%	
A-B > 0 ?	1	1	1	1	0		

- We conducted this analysis on all social activities and groups in which statistically significant differences were found by χ squared test.

Result of the survey : which group answers earlier time? (2/2)

number of A-B > 0 social activities at each time: index of A is earlier than B
 (A: accumulated percentage of the answers of "yes" of the former group
 B: accumulated percentage of the answers of "yes" of the latter group)

groups		* all	right after	1 week	1 month	3 months	6 months
address	Owari and Nishi-Mikawa	6	2	1	3	2	1
	Owari and Higashi-Mikawa	7	7	2	6	7	4
	Nishi-Mikawa and Higashi-Mikawa	6	6	4	4	6	5
occupation	public employees and company employees	2	2	2	0	0	0
	public employees and others	22	22	22	21	21	19
	company employees and others	15	15	15	15	15	14
age (-59, 60-)		8	8	8	7	6	2
sex (male, female)		24	24	24	23	22	13
income	-5million yen and 5-10million yen	2	1	2	0	0	0
	-5million yen and 10- million yen	3	0	0	0	2	1
	5-10 million yen and 10- million yen	4	1	2	3	2	0
living with infants or elders and not living with		2	2	2	0	1	1
people mainly imagined	all Japan and all damaged areas	32	32	32	32	31	9
	all Japan and Aichi+close	31	31	31	31	30	14
	all damaged areas and Aichi+close	2	0	1	0	1	2

* "all" means the numbers of social activities which statistically significant difference($p < 0.1$) was found between the two groups.

Discussion on the result

- We have found when is thought to be appropriate to start 32 kinds of social activities in Aichi prefecture through the survey.
- Especially, some economy related activities like “Giving water recovery priority to an economically important area” and “Asking for a quick recovery of roads to a company’s site by a major company in the area” were thought to be okay in Aichi even at the earlier stage of recovery.
- However, “when is appropriate”(i.e. sense of prioritizing schedule) differs by occupation, sex and what kind of people he or she imagines. Public employees, company employees, male and those who imagines all people in Japan tend to think “appropriate” at earlier time.
- This difference should be taken care in planning a recovery strategy. (Actually, we are planning to have workshops on making recovery strategy in Aichi. So we are going to take this care.)
- If decision makers want to start some kind of social activities at earlier time than the one the residents think appropriate, the result of this survey helps them to choose better words to mitigate conflicts when they explain the reason of their decision.

Thank you!