2. Status of occurrence of accidents and necessary safety measures

This Chapter presents the accidents in the local railways and the points to be referred to for safety measures to prevent the similar accidents.

As described above, a total of 99 local railway accidents and serious incidents occurred. They were investigated by the former Aircraft and Railway Accidents Investigation Commission and the Japan Transport Safety Board (JTSB) between October 2001 ~ March 2023 and accident investigation reports were published. This means that 1 ~ 8 accidents have occurred annually (average: 4.5) (See Figure 1).

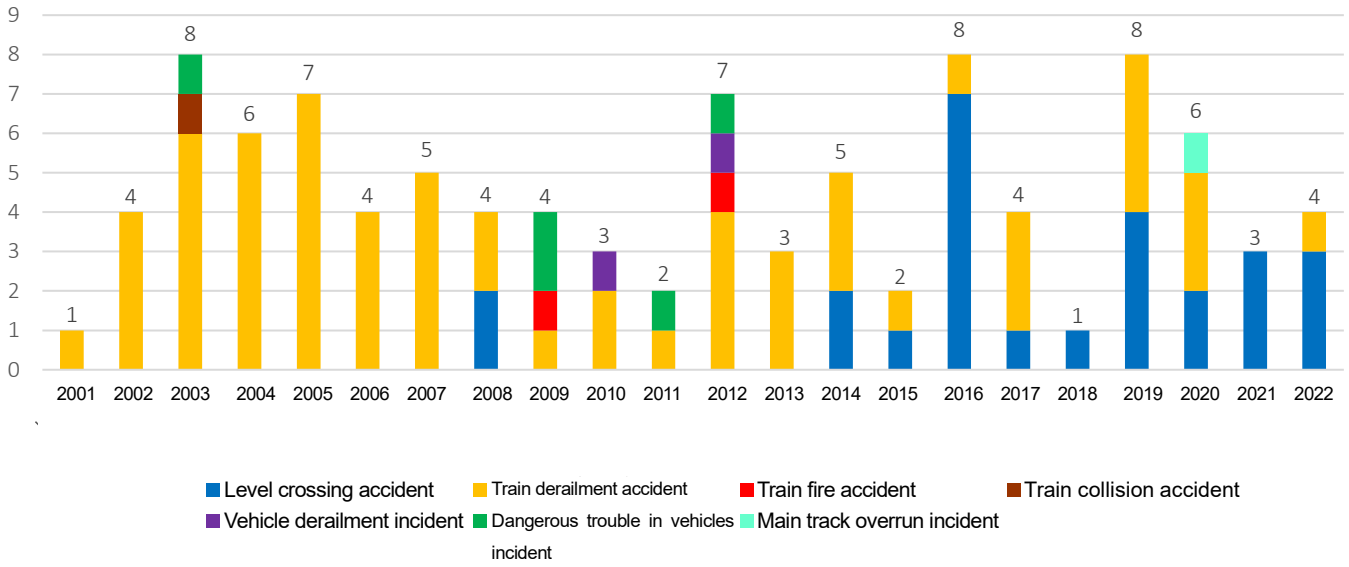


Figure 1: Number of occurred accidents, etc. in the local railways

It seems that the number of level crossing accidents has increased since 2014. This is because fatal accidents occurred at the level crossings where crossing gates are not installed (class 3 level crossings) and the level crossing where crossing gates and road warning devices are not installed (class 4 level crossings) were newly added to the target of investigation in April 2014.

Status of accidents occurred

When we categorize 99 accidents by category (Figure 2), the most common cause is train derailment, accounting for about 63% of all accidents, followed by level crossing accident (approximately 26%). Since these two accident categories account for about 90% of all accidents, we can say that they are the principal accident categories in local railways. Therefore, we analyze more detail thereon.

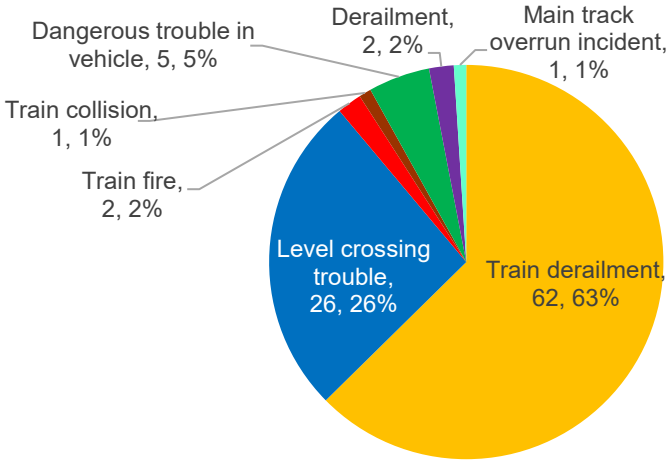


Figure 2: Classification of accidents, etc. in the local railways by category

Train derailment accident

If we look at the breakdown of factors of 62 train derailment accidents (Figure 3), **the most common factor in the local railways is "Track: Maintained status of ground facilities such as the track" and accounts for about 43%. For a reference**, if we look at the breakdown of 147 "train derailment accidents" of the JR lines and major private railway companies other than the local railway companies (Figure 4), "Track: Maintained status of ground facilities such as the track" only accounts for about 7%. We can notice a different tendency.

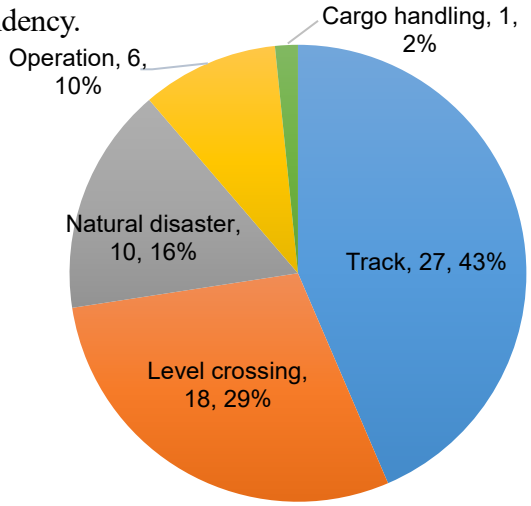


Figure 3: Classification of the factors of train derailment accidents in the local railways

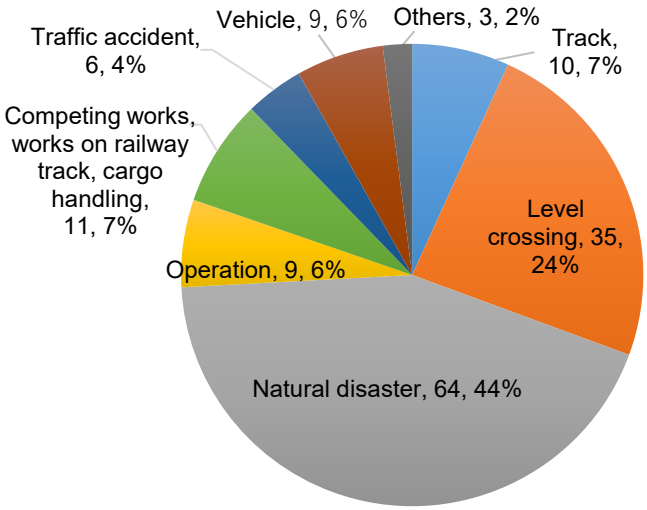


Figure 4: Classification of the factors of train derailment accidents other than the local railways

Then, if we pay attention to the yearly number of accidents caused by "Track", "Level crossing such as the collision with automobile which had entered the level crossing", "Natural disaster such as the vehicle ran over the earth and sand", and "Operations: handling operation" (Figure 5), the 5-year moving average graph shows that it has decreased other than "track". Although the number of accidents caused by "track" has been decreasing, **the tendency remains almost the same. In the past 10 years, nearly 80% of the train derailment accidents in the local railways is caused by "track".**

※The number of accidents of 2021 and 2022 does not include the accidents under investigation as of April 1, 2023. Moreover, the year 2001 is excluded, because the period for obtaining statistics did not reach 1 year.

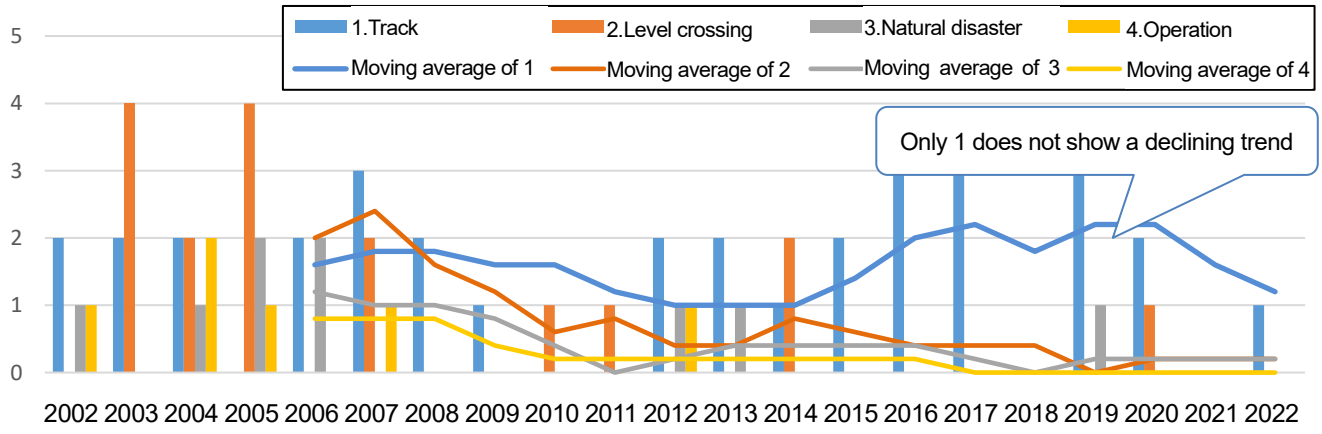


Figure 5: Number of train derailment accidents in the local railways by cause (the line graph is 5-year moving average)

Based on the above data, we have found out that the train derailment accidents in the local railways have the following characteristics.

- **The number of accidents caused by "track" is larger compared to other railway operators.**
- **The number of accidents caused by "track" does not show a declining tendency and remains the principal cause of recent train derailment accidents.**

As for the train derailments caused by "track", on June 28, 2018, the JTSB stated its "opinion to prevent the train derailment accident caused by the gauge widening" (hereinafter referred to as "the opinion"). Moreover, the JTSB Digests No. 28[1] (hereinafter the "Digests No. 28") points out the characteristic that "the number of train derailment accidents caused by track is large in the local railways" and presents some examples of initiatives from which we can draw lessons and of initiatives to prevent accidents. Table 1 describes the outline of content which the JTSB requested to inform the railway operators in the opinion.

Table 1: Outline of the "opinion to prevent the train derailment accident caused by the gauge widening"

1.	On the managing method of the track maintenance
(i)	It is necessary to manage rail fastening devices, etc., properly by the periodic inspections of tracks and the track patrols, and also it is necessary to implement measures to prevent gauge windings. It is necessary to pay attention to the continuity of looseness of rail fastening devices, etc. and to give priority to steep curve with large slack.
(ii)	The measurement of track irregularity measured under loaded condition using track inspection car is the effective method on the measurement of track irregularities. Rail fastening devices, etc. should be managed adequately, when implement the management of track irregularities based on the measurement of track irregularity measured under unloaded condition only.
2.	On the managing standard of track maintenance
(i)	Decide the maintenance standard values of the track irregularity considering the limit of safety
(ii)	Make clear the period of maintenance when the maintenance standard values are exceeded
(iii)	Decide the handling of the operation control and the track maintenance, etc., when the remarkable track irregularity was detected
(iv)	Confirm that the slack in the curved track is arranged to the proper value corresponded to the running vehicles
3.	On the track structure
(i)	It is desirable to implement systematically the replacement to concrete sleepers, etc., considering the places in high priority based on the generated status of defects of sleepers and the track shape, etc.
(ii)	It is desirable to install guard angles or guard rails as possible, when installed the guard rail, etc., in the curved section, and it is also necessary to inspect and check the status of materials and maintenance by the periodic inspections and implement repairing works

Although no accident caused by track occurred in 2018 when the opinion and the digest No. 28[1] were published, **several accidents caused by "track" factor have occurred every year since then**. When we look at the relationship between the content of the opinion and 6 accidents occurred after 2018 (Table 2), we can see that all of them occurred due to insufficient measures in response to the opinion.

[1] The Japan Transport Safety Board Digests Vol.28, For the prevention of derailment accidents, "Points of management of the track maintenance", https://www.mlit.go.jp/jtsb/bunseki-kankoubutu/jtsbdigests_e/jtsbdigests_No28/No28_pdf/jtsbdi-28_all.pdf

Table 2: Comparison table of the causes of accidents occurred after the opinion was issued and the content of the opinion

"×" means that the accident occurred because no measure has been taken in response to the opinion

	1(i)	1 (ii)	2(i)	2(ii)	2(iii)	2(iv)	3(i)	3(ii)	Others
Case 1	×	×	×	×		※2	×	×	Insufficient technical capacity
Case 2	×	×	×	×		※2	×		Insufficient technical capacity
Case 3	×	×					×		Insufficient technical capacity
Case 4	×	×					※3		Insufficient technical capacity + Lack of communication
Case 5	×	×	※1	×					Insufficient technical capacity
Case 6	×	×	×	×		※2		×	Insufficient technical capacity

※1 There is a description in the accident investigation report that "it is desirable to decide the standard values considering the limit of safety by the deadline, because too many reference values are exceeded.

※2 There was no clear flaw, since there is a description in the accident investigation report that "the margin against derailment to inside gauge had been decreased".

※3 An idea of partially replacing to PC sleepers was correct, but priority was not determined based on safety.

In all examples, the accidents were caused by the improper maintenance management method of track. Moreover, in more than half of the examples, the maintenance standard values were not established properly. Since the lack of technical abilities is pointed out in most of the examples, **it is desirable to take the initiative to use the technical support provided by various corporations**.

Furthermore, the replacement to the concrete sleepers, etc. (hereinafter referred to as "PC sleepers, etc.") is recommended. In cases where it is difficult to secure a sufficient budget, the "**partial replacement to PC sleepers**" (one out of several sleepers is replaced to a PC sleeper, etc.) or the "**priority-based installation**" (the construction starts from the places in high priority based on safety such as steep curves) is recommended. The technical support, etc. provided by various corporations can be used to examine the ratio of PC sleepers, etc. in consideration of the conditions such as running vehicles, track shape, etc. and to examine the places in priority in consideration of the danger of derailment to inside gauge due to gauge widening. We expect that this will be translated into the measures to maximize the effect from limited expenses together with the national subsidy system. In Case 5 shown in Table 2, a gauge widening risk was underestimated, because the replacement to PC sleepers completed. As a result, rail fastening devices were not managed and maintained properly. **It is necessary to keep in mind that the proper maintenance management of tracks is required continuously even after PC sleepers are installed**.

Chapter 3 of this digest presents Case 2 shown in Table 2 in which the partial replacement to PC sleepers and the revision of the maintenance standard values were carried out as the post-accident measures. Chapter 4 presents the technical support provided by each corporation, etc. and the national subsidy system available for the "partial replacement to PC sleepers" and "priority-based installation".

Points of train derailment accidents caused by "track"

○ The number of this type of accidents has not decreased in recent years. Many of the derailment accidents in local railway operators were caused by the maintained status of the ground facilities such as the track, etc.

○ It is important to take proper measures based on "the opinion" issued by JTSB in the past.

○ In cases where it is difficult for a local railway operator to take measures by itself for economic or technical reasons, **it is desirable to carry out the "partial replacement to PC sleepers" or "priority-based installation", etc. by making use of the technical support provided by various corporations or the national subsidy system** (the proper maintenance management is required continuously even after the replacement to PC sleepers completes).

It was explained that the number of train derailment accidents caused by "level crossing", "natural disaster", and "operation" has been decreasing other than "track". However, as accidents caused by those factors occur once every few years, it is necessary to continue to take safety measures. Particularly, natural disasters may cause railway accidents, because heavy rains caused by typhoons, etc. have become severer and more frequent and caused the inclination and washout of train bridges across a river in recent years.

The JTSB issued its opinion to the Minister of MLIT in the past in response to a train derailment accident caused by the bridge pier scouring due to river level rises. The opinion is considered to be useful for taking measures for scouring by the local railways. Moreover, the MLIT invited the JR companies to hold the "Review Committee on Measures for JR's River Bridges" in September 2021 to discuss measures to prevent the damages caused by heavy rains. The details are available on the following websites as a reference of disaster prevention measures such as preventive conservation of structures. Chapter 3 includes a column of a railway operator that took the measures using the subsidy.

○ Opinion on Train Derailment Accident of the Nankai Electric Railway Co., Ltd. (Opinion of January 31, 2019)
The opinions, full text, is published in the website of the JTSB,
https://www.mlit.go.jp/jtsb/eng-rail_report/English/Railway_opinion20190131.pdf

○ Review Committee on Measures for JR's River Bridges (Held on September 28, 2021)
The materials distributed at the Review Committee on Measures for JR's River Bridges are published in the website of the MLIT.
https://www.mlit.go.jp/tetudo/content/001425578.pdf (only available in Japanese)

Level crossing accidents at class 3 and class 4 level crossings

The most of "level crossing accidents" investigated by the JTSB are fatal accidents occurred at class 3 and class 4 level crossings. When we look at the number of accidents occurred at the class 3 and class 4 level crossings (Figure 6), the accidents have occurred every year, although the number varies significantly every year. Hence, it is necessary to continue to abolish those level crossings or transform them to class one level crossings (hereinafter "class-one conversion") by installing level-crossing security equipment.

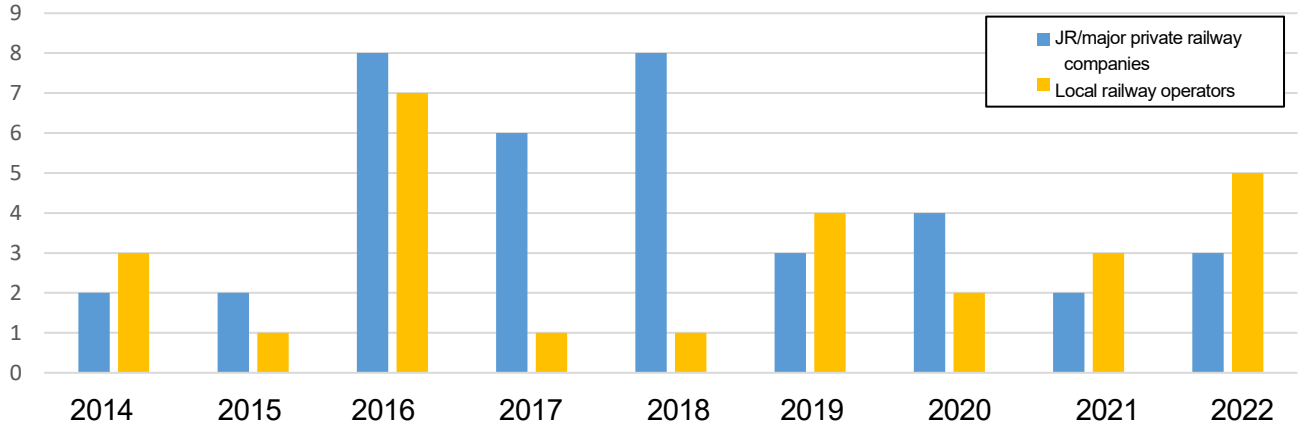


Figure 6: Number of accidents at class 3 and class 4 level

In the local railway operators, the ratio of the class 3 and class 4 level crossings to the total number of level crossings is three times as high as the JR/major private railway companies. (Table 3).

Table 3: Number of level crossings of the JR/major private railway companies and the local railway operators

	Total number of level crossings	Number of the class 3 and class 4 level crossings	Ratio of the class 3 and class 4 level crossings
JR/major private railway companies	25,053	1,685	6.7%
Local railway operators	7,040	1,353	19.2%

※The number of level crossings was obtained from the Railway Bureau of the MLIT: Information on Safety of Railway and Tramway Transport (FY2021)

Moreover, **when we look at the status of the post-accident measures for the class 3 and class 4 level crossings where accidents occurred in the past, about 60% were abolished or converted into class 1 level crossings in the JR and major private railway companies, while only about 36% in the local railway operators** (Table 4).

Table 4: Status of the measures taken for those level crossings where accidents occurred by the JR/major private railway companies and the local railway operators

	Type of measure taken	Number of level crossings where measures have been taken	Ratio (%) of level crossings where measures have been taken	Total number of measures taken	Total (%) of level crossings where measures have been taken
JR/major private railway companies (35 accidents)	Abolishment	10	29%	21	60%
	Class-one conversion	11	31%		
Local railway operators (22 accidents)	Abolishment	3	14%	8	36%
	Class-one conversion	5	23%		

※The statistics were obtained from the reports issued between April 2014 when the JTSB started to investigate the fatal accidents occurred at level crossings where crossing gates are not installed and September 2022 when the follow-up survey on the status of measures taken was conducted.

The number of level crossings converted into class 1 is larger than those abolished both in the JR/major private railway companies and the local railway operators. In many of those cases, they intended to abolish the class 3 and class 4 level crossings, but negotiations with the local governments and the local residents were complicated and changed the policy to the class-one conversion. However, many local railway operators comment that the class-one conversion is difficult for economic reasons. In the cases where the level crossings were converted into class 1, the local governments covered all or part of the construction expenses or the subsidy was used. In some cases, it is difficult to pay their own expenses, because the subsidy does not cover 100%. The class-one conversion has an advantage that it is easier to gain an understanding of the local residents, because the level crossing remains. However, **it is desirable for the local railway operators to aim to "abolish" the class 3 and class 4 level crossings, in principle, from the economic and safety points of view**.

The follow-up survey on the status of post-accident measures reveals that one of the factors of a low rate of post-accident measures in the local railway operators is **the lack of discussions**. The average number of discussions of the local railway operators is fewer than that of the JR and major private railway companies (Table 5). Especially, there is a wide gap in the number of discussions for the cases where post-accident measures have not been taken. **In more than half of the cases where the local residents are against the abolishment, the local railway operators have not set any place for discussion, because they do not find any solution.** Since there are cases where an agreement on the abolition or class-one conversion is reached in the first discussion, the lack of discussions is not necessarily the factor of the low rate of taking measures. However, it is difficult to think that an agreement is reached without discussions in cases where the local residents are against the abolition plan. Therefore, **it is important to repeat discussions** for the purpose of finding an alternative to convince them. Moreover, keeping a record of discussions is also effective.

Table 5: Average number of discussions after the accidents by the JR/major private railway companies, and local railway operators

	Average number of discussions ※1	Average number of discussions per year ※2
JR/Major private railway companies	4.5	4.7
Cases where measures have been taken	4.0	6.9
Cases where measures have not been taken	5.6	1.7
Local railway operators	1.9	1.2
Cases where measures have been taken	3.7	2.8
Cases where measures have not been taken	0.4	0.1

※1 The calculations were made from 39 cases where we received answers on the number of discussions in the follow-up survey on the status of measures taken among 57 cases of accidents.

※2 The average number of discussions was converted to the annual number based on the period between the time when the accidents occurred and the completion of measures (the cases where measures have been taken) or between the time when the accidents occurred and the follow-up survey (the cases where measures have not been taken). The average is calculated by case (the number of discussions/period (year)).

When we look at the period required from an accident to the abolition or class-one conversion (Figure 7), the level crossing was abolished within 1 year in 9 out of 12 cases. In the case of the local railway operators, the level crossing was abolished within 1 year in all cases. The class-one conversion takes time due to the time required for securing necessary budget or for construction works.

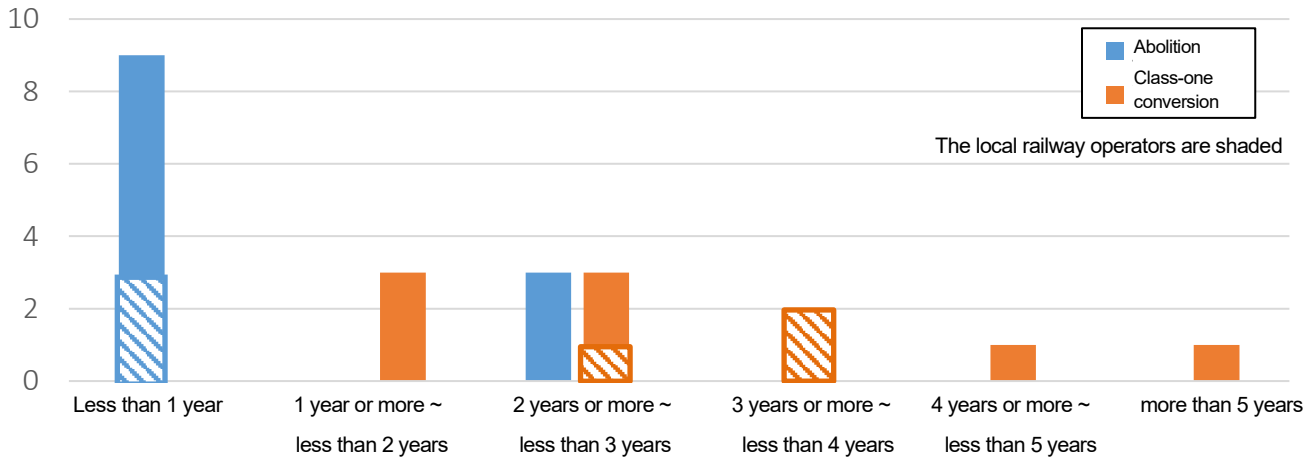


Figure 7: Period required from the accident to the abolition or class-one conversion

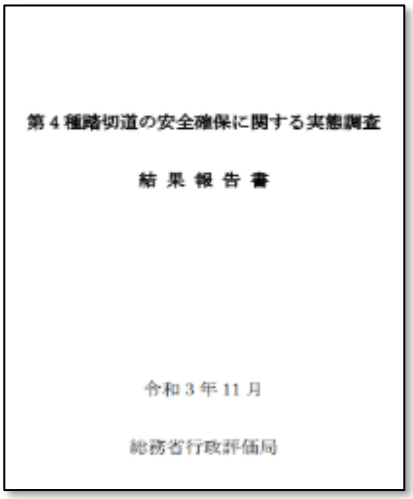
※ This figure shows 22 cases where answers on the period until measures are taken were obtained in the follow-up survey on the status of measures taken among 29 cases where measures have been taken.

When we look at those cases where the level crossing was abolished within 1 year from the accident, **a way of thinking of the local government and the local residents changed after the fatal accident and discussions for abolishment moved ahead in the most of cases**. Even in the cases where the local residents are against the abolition after the accident, the local government, the police, and neighborhood associations make an effort for moving ahead discussions.

In some cases where discussions for abolition stay stalled, the accident has been forgotten over time and a momentum of the relevant parties for abolition has cooled down. It is ideal to abolish the class 3 and class 4 level crossings before any accident occurs, but **it is desirable to move ahead discussions for the early abolition or class-one conversion, while the relevant parties are strongly aware of the danger of the level crossing**.

There was a case where **the level crossing was abolished after more than 2 years have passed since the accident by taking sufficient time to have a lot of discussions for the purpose of gaining an understanding of the local residents**. This case is presented in Chapter 3 of this digest. Moreover, there was a case where the abolishment was decided to give priority to safety after repeating several explanation sessions and meetings to exchange opinions, though all local residents were not in favor of the decision.

As regards the class 4 level crossings, the Minister of Internal Affairs and Communications issued a recommendation[2] requiring improvements as to fostering discussions and consensus building in the communities through the Local Level Crossing Improvement Council and other channels for the abolition or class-one conversion of level crossings to the Minister of Land, Infrastructure and Transportation on November 30, 2021. Moreover, the JTSB Digests Vol. 31[3] present the classification and points of the background of cases where the class 3 and class 4 level crossings were abolished. Please refer to the report of the Ministry of Internal Affairs and Communications and the JTSB Digests for discussing and building consensus on the abolition of the class 3 and class 4 level crossings or their class-one conversion in the communities.


第４種踏切道の安全確保に関する実態調査

結 果 報 告 書

令和３年11月

総務省行政評価局

Furthermore, Chapter 3 presents the column of awareness-raising activities to prevent level crossing accidents in the local railway operator for your reference.

Points of the level crossing accidents at the class 3 and class 4 level crossings

- **The ratio of the class 3 and class 4 level crossings is high in the local railway operators and the rate of level crossings where post-accident measures have been taken is low**.
- It is required to take concrete measures for the class 3 and class 4 level crossings urgently including their abolition. However, **in many cases where measures have not been taken, local railway operators have not discussed with the relevant parties such as local governments**.
- **It is effective to refer to the initiatives to abolish level crossings in the past** in order to move forward discussions. Moreover, in cases where an accident occurs, it is effective to move forward discussions at an early stage. However, **it is also required to make continuous efforts to find an alternative by repeating discussions and gain an understanding of local residents**.

[2] Administrative Evaluation Bureau, Ministry of Internal Affairs and Communications, "Survey on Safety of the Class 4 Level Crossings (recommendation based on the results)", https://www.soumu.go.jp/menu_news/s-news/hyouka_211130000153246.html (only available in Japanese)

[3] JTSB Digests Vol. 31, "The level crossing without crossing gate is dangerous ~ Urgent measures required to abolish or to prepare crossing gate, road warning device, https://www.mlit.go.jp/jtsb/bunseki-kankoubutu/jtsbdigests_e/jtsbdigests_No31/No31_pdf/jtsbdi-31_all.pdf