WHAT IS CLAIMED IS:

1. A method of operating a non-volatile memory device, which communicates with a storage controller, the method comprising:

receiving a first request indicating a read reclaim determination and including environment information from the storage controller;

performing a first on-chip read operation for generating first distribution information based on the first request;

determining whether a read reclaim is required based on the first distribution information; and

providing the storage controller with a determination result having a first bit value in response to determining that the read reclaim is required,

wherein the method further comprises:

before receiving the first request, receiving a second request indicating a read operation for target data corresponding to the first on-chip read operation from the storage controller;

performing a second on-chip read operation for generating second distribution information based on the second request; and

providing the second distribution information to the storage controller.

2. The method of claim 1, further comprising:

after providing the determination result having the first bit value, receiving a third request indicating a read reclaim operation from the storage controller; and

performing the read reclaim operation based on the third request.

3. The method of claim 2, wherein the non-volatile memory device does not provide the storage controller with the target data or the first distribution information corresponding to the first on-chip read operation during a period from a first time when the non-volatile memory device provides the determination result having the first bit value to a second time when the non-volatile memory device receives the third request indicating the read reclaim operation.

4. The method of any one of claims 1 to 3, wherein the environment information includes:

offset information indicating a difference between an optimized valley and a default valley;

write temperature information when the target data corresponding to the first on-chip read operation are stored in the non-volatile memory device;

a number of program/erase (P/E) cycles of the non-volatile memory device;

a count value of a read operation for the target data;

maximum error correcting code (ECC) information of the storage controller; and/or

word line information indicating whether coupled word lines exist.

5. The method of claim 4, wherein the performing of the first on-chip read operation for generating the first distribution information based on the first request includes:

determining whether the first request includes the offset information;

in response to determining that the first request does not include the offset information, performing the first on-chip read operation based on a default read voltage level; and

in response to determining that the first request includes the offset information,

performing the first on-chip read operation based on a read voltage level optimized based on the offset information.

6. The method of claim 4 or claim 5, wherein the environment information includes the write temperature information,

wherein the performing of the first on-chip read operation for generating the first distribution information based on the first request includes:

generating, using a temperature sensor of the non-volatile memory device, read temperature information based on the first request,

wherein the determining whether the read reclaim is required based on the first distribution information includes:

determining whether the read reclaim is required, based on the first distribution information, the write temperature information, and the read temperature information.

7. The method of any one of claims 1 to 5, wherein the first on-chip read operation includes an on-chip valley search (OVS) read operation based on a target read voltage level,

wherein the first distribution information includes:

a first count value indicating the number of memory cells whose threshold voltages are between the target read voltage level and a first reference voltage level lower than the target read voltage level as much as a reference voltage amount; and

a second count value indicating the number of memory cells whose threshold voltages are between the target read voltage level and a second reference voltage level higher than the target read voltage level as much as the reference voltage amount.

8. The method of claim 7, wherein the first count value and/or the second count value has a non-linear correspondence relationship with regard to an error count value corresponding to the target read voltage level.

9. The method of claim 7, wherein the first count value and/or the second count value has a linear correspondence relationship with regard to an error count value corresponding to the target read voltage level.

10. The method of any one of claims 7 to 9, wherein the determining whether the read reclaim is required based on the first distribution information includes:

when the environment information does not include offset information and does not include write temperature information, determining whether the read reclaim is required based on the first distribution information, a first parameter value, and a second parameter value;

when the environment information includes the offset information and does not include the write temperature information, determining whether the read reclaim is required based on the first distribution information, a third parameter value, and a fourth parameter value;

when the environment information does not include the offset information and includes the write temperature information, determining whether the read reclaim is required based on the first distribution information, a fifth parameter value, and a sixth parameter value; and

when the environment information includes the offset information and includes the write temperature information, determining whether the read reclaim is required based on the first distribution information, a seventh parameter value, and an eighth parameter value.

11. The method of claim 10, wherein the determining whether the read reclaim is required based on the first distribution information, the first parameter value, and the second parameter value, when the environment information of the first request does not include the offset information and does not include the write temperature information includes:

determining that the read reclaim is required when a sum of the first count value and the second count value exceeds the first parameter value, when the first count value exceeds the second parameter value, or when the second count value exceeds the second parameter value.

12. The method of claim 10 or claim 11, wherein an E-fuse circuit of the non-volatile memory device stores the first to eighth parameter values.

13. The method of any one of claims 1 to 12, further comprising:

providing the storage controller with the determination result having a second bit value different from the first bit value, in response to determining that the read reclaim is not required; and

receiving a fourth request indicating a read operation or the read reclaim determination from the storage controller.

14. The method of claim 1, further comprising:

before receiving the first request, receiving a fifth request indicating a write operation for the target data corresponding to the first on-chip read operation from the storage controller;

performing the write operation based on the fifth request;

while performing the write operation, generating, using a temperature sensor of the non-volatile memory device, write temperature information; and

providing the write temperature information to the storage controller.

15. A method of operating a storage device, which includes a non-volatile memory device and a storage controller, the method comprising:

providing, by the storage controller, a first request indicating a read reclaim determination and including environment information to the non-volatile memory device;

performing, by the non-volatile memory device, a first on-chip read operation for generating first distribution information based on the first request;

determining, by the non-volatile memory device, whether a read reclaim is required based on the first distribution information;

providing, by the non-volatile memory device, the storage controller with a determination result having a first bit value in response to determining that the read reclaim is required;

providing, by the storage controller, the non-volatile memory device with a second request indicating a read reclaim operation based on the determination result having the first bit value; and

performing, by the non-volatile memory device, the read reclaim operation based on the second request,

wherein the method further comprises:

before receiving the first request, receiving a third request indicating a read operation for target data corresponding to the first on-chip read operation from the storage controller;

performing a second on-chip read operation for generating second distribution

information based on the third request; and

providing the second distribution information to the storage controller.

16. The method of claim 15, further comprising:

providing, by the non-volatile memory device, the storage controller with the determination result having a second bit value in response to determining that the read reclaim is not required;

providing, by the storage controller, the non-volatile memory device with a fourth request indicating a read operation or the read reclaim determination based on the determination result having the second bit value; and

processing, by the non-volatile memory device, the fourth request.

17. A non-volatile memory device comprising:

a memory cell array configured to store target data; and

control logic configured to manage the target data based on communication with a storage controller,

wherein the control logic is configured to:

receive a first request indicating a read reclaim determination and including environment information from the storage controller;

perform a first on-chip read operation of the target data for generating first distribution information based on the first request;

determine whether a read reclaim for the target data is required based on the first distribution information;

provide the storage controller with a determination result having a first bit value in response to determining that the read reclaim is required; and

provide the storage controller with the determination result having a second bit value, different from the first bit value, in response to determining that the read reclaim is not required,

wherein the control logic is further configured to:

before receiving the first request, receive a second request indicating a read operation for the target data corresponding to the first on-chip read operation from the storage controller;

perform a second on-chip read operation for generating second distribution information based on the second request; and

provide the second distribution information to the storage controller.

18. The non-volatile memory device of claim 17, wherein the control logic includes:

a distribution information generator configured to generate the first distribution information based on the on-chip read operation for the target data;

a reclaim determiner configured to determine whether the read reclaim for the target data is required based on the first distribution information;

a temperature sensor configured to generate temperature information when the first on-chip read operation or a write operation is performed; and

an E-fuse circuit configured to store the first distribution information and to store a plurality of parameter values used to determine whether the read reclaim for the target data is required.

19. The non-volatile memory device of claim 18, wherein the plurality of parameter values include a first parameter value, a second parameter value, a third

parameter value, a fourth parameter value, a fifth parameter value, a sixth parameter value, a seventh parameter value, and an eighth parameter value, and

wherein the reclaim determiner is further configured to:

when the environment information does not include offset information and does not include write temperature information, determine whether the read reclaim is required based on the first distribution information, the first parameter value, and the second parameter value;

when the environment information includes the offset information and does not include the write temperature information, determine whether the read reclaim is required based on the first distribution information, the third parameter value, and the fourth parameter value;

when the environment information does not include the offset information and includes the write temperature information, determine whether the read reclaim is required based on the first distribution information, the fifth parameter value, and the sixth parameter value; and

when the environment information includes the offset information and includes the write temperature information, determine whether the read reclaim is required based on the first distribution information, the seventh parameter value, and the eighth parameter value.