It is essential that such monitoring programmes have clearly defined objectives the environment and human health - field monitoring. selection process were correct and sufficient to protect assumptions made during the permit review and site monitoring and that

mer computance monitoring and that the assumptions made during the permit review and site clearly defined objectives. It is essential that such monitoring programmes have the environment and human health · field monitoring. selection process were correct and sufficient to protect

- 42 It may usually be assumed that suitable specifications of existing (pre-disposal) conditions in the receiving 41 と 42の順序が逆となっていた) permit application is made. the licensing authority before any final decision on the Hypothesis, additional information will be required by inadequate to permit the formulation of an Impact dumping. If the specification of such conditions is area are already contained in the application for (注:CO2WAG ではパラ
- questions must be answered: environment are within those predicted. The following be designed to ascertain that changes in the receiving field monitoring. The measurement programme should The Impact Hypothesis forms the basis for defining
- 1 What testable hypotheses can be derived from the Impact Hypothesis?
- .2 What measurements 3 How should the data be managed and interpreted? these hypotheses: performance requirements) are required to test (type, location, frequency,

account of relevant research information in the design and modification of monitoring programmes. The The permitting authority is encouraged to take

monitoring program

- assumptions made during the permit review and site environmental management plans in order to mitigate Monitoring also allows for effective management of selection process were correct and sufficient to protect clearly defined objectives and are linked to essential that such monitoring programmes have disposal sites, and allows for management if it is found possible effect of injection activity and storage. the environment and human health - field monitoring. hat permit assumptions were incorrect.
- 8.2 Compliance monitoring should be conducted during injection operations to ensure that injection rates, pressures, mechanical integrity and CO2 properties are as described in the project proposal and permit
- 8.3 It may usually be assumed that suitable specifications appropriate in section 9) (EDITORIAL NOTE: of existing (pre-disposal) conditions in the receiving area are already contained in the application for permit application is made. For disposal of carbon the licensing authority before any final decision on the inadequate to permit the formulation of an impact dumping. due to the disposal of carbon dioxide can be measured. information is required from which changes that arise Hypothesis, additional information will be required by in sub sea geological structures, baseline If the specification of such conditions is Std.1 section may é erott
- 8.4 The Impact Hypothesis forms the basis for defining receiving environment are within those The following questions must be answered: should be designed to ascertain that changes in the field monitoring. The measurement programme predicted.
- .1 What testable hypotheses can be derived from the Impact Hypothesis?
- .3 How should the data be managed and interpreted? .2 What measurements (type, performance requirements) these hypotheses are required location, frequency, 당 test
- 8.5 Due to the large area of potential storage sites there modelling and sampling in a way that makes detection of leaks over the large area possible and defensible. geological formations will be important due to the long time scales of carbon sequestration, the potential for or leakage of carbon dioxide streams from sub-seabed Moreover, long term monitoring of potential migration strategic design of monitoring programmes that use large disposal sites, and the buoyant nature of carbon
- 8.6 The permitting authority is encouraged to take account of relevant research information in the design and modification of monitoring programmes. The and modification of monitoring programmes. should look at integrity of the

8 路板

- 8.1 類説は、幹回条件が満たなわたであいる(遡中に図する ること及び注入行為及び貯留により起こりうる影響を緩 理を可能にする。当該照視計画が目的を明確に特定したい **常回の西場条件が適ちせたへいないと判別した場合の**領 行われる。また、観視は処分撮所の効果的管理や回信にし、 十分であったこと(現場における監視)を実質するために れた検討が蝦夷及び人の健康を保護するために圧縮から 羅佛)並びに許可幹値及び処分場所の選択過程の間になる **やするための戯戯舞理評画と関連付けることは重要であ**
- 8.2 強入率、強入圧、機械的完全性、及び二酸化炭素の性質 が事業企画書及び許可要件に記載されているものと同様であるにとを確認するため、遂守に関する監視が実施され **めんかんめる。**
- (編集注:本項は、9章に記載するほうが適切かもしれない。 8.3 投棄申請擔づは、通常は、海域の現況(処分前)に関す い。係る現況の記述が、影響仮院を策定するために不十分 **行や測圧する基準となるベースシイン事機な限択さざる。** 局により追加的情報が要求される。海底下地質構造への二 ならば、許可申請に対する破無決定がなされる前に許可当 る適切な記述があらかじめ明示されていることが望まし 酸化炭素流処分については、二酸化炭素処分に超因する変
- 8.4 影響仮説は現場における監視の実施内容の基礎とな \$\ \ \ \ 影響が予結の総囲内であることが確認できるように設計すべきためる。以下の点について思語にされなければなら る。適応プログラムの策反に当たっては、投獄による誤滅
- 、1 どのような検証可能な仮説が影響仮説から導き出さ たりるか。
- .2 どのような測定(種類、場所、頻度、要求精度)がこ 3 データはどのように管理及び解釈されるべきか。 の仮院を検路するために必要なる
- 8.5 潜在の貯留サイトは反換にされるれる、回語な綴りな 軸、廃棄場所の潜在的な広範さ、及び、二酸化炭素の浮揚 性などの理由から重要である。 要がある。さらに、海底下地質累層からの二酸化炭素流の溶在的移動又は漏洩の長期的監視は、炭素隔離の長期時間 **心予防的に広域への源波を検出いきるモデルと野科を刑** 用する類視プログラムの酸略的計画を興動に検討する必
- 8.6 許可当局は、監視計画の策定及び修正に当たり、 関連の

within the zone of predicted impact and those outside.

of carbon dioxide streams in sub-seabed geological storage site and safeguarding human health and the marine environment. The measurements for disposal formations can be divided into four types: サイトの完全性(密別性)と、ドトの健康および海洋環境の保護を考察するべきである。二酸化炭素洗の海底下地質以層 調査情報を考慮に入れることが選まれる。照視計画は、貯留 への処分のための遺伝は4しに分類できる。

- I performance monitoring (sometimes referred to as within the intended sub-seabed geological formation; well injected carbon dioxide stream is retained testing the Impact Hypothesis) which measures how
- 2 monitoring the surrounding geological layers to formation; stream out of the detect and measure migration of the carbon dioxide intended sub-seabed geological
- .3 monitoring the seafloor and overlying water to geological formation; and abandoned wells context, special stream into detect and measurs leakage of the carbon dioxide the marine environment. attention should be given that intersect the sub-seabed ಸ દ
- monitoring marine communities (benthic and water column) to detect and measure effects of any leaking carbon dioxide streams on marine organisms,

44 Measurements should be designed to determine

8.7 Measurements should be extent of change that occurs as a result of the disposal sub-seabed geological formation, the frequency operation. of measurements that provide information on the communities, this can be answered by the acquisition momtoring can be decreased. dioxide streams are not migrating or leaking from the can be detected. based on a null hypothesis - that no significant change layers, the seafloor and overlying water, and marine exceeded, time that ensures that the projected spatial scale is not 7 Measurements should be designed to determine whether impacts differ from those predicted. For performance monitoring, this can be answered by designing a sequence of measurements in space and Frequently, these measurements will be For monitoring of overlying geological As confidence grows that carbon 2

of change that occurs outside the zone of impact as a

8

answered by

the acquisition

no significant change can be detected.

measurements will be based on a null hypothesis · that result of the dumping operation. Frequently, these measurements that provide information on the extent projected spatial scale of change is not exceeded. The measurements in space and time that ensures that the outside the zone of impact differ from those predicted whether the zone of impact and the extent of change The former can be answered by designing a sequence of

or overlying water is detected, monitoring of marine geological formation is detected, monitoring the seafloor streams into the geological layers above the sub-seabed (EDITORIAL NOTE: discussion is ongoing regarding the following text currently deleted from section 8.7 in the communities may not be necessary. uniess leakage of carbon dioxide streams into the seafloor and overlying water may not be necessary. Similarly, current version: Unless migration of carbon dioxide

8.8 The results of monitoring (or other related research) the objectives and can provide a basis to: should be reviewed at regular intervals in relation to

45 The results of monitoring (or other related research)

should be reviewed at regular intervals in relation to

the objectives and can provide a basis to :

.lmodify or terminate the field monitoring programme;

. I modify or terminate the field monitoring

.2 modify or revoke the permit. .3 redefine or close the site, and

.4 modify the basis on which applications to .3 redefine or close the dump site; and .2 modify or revoke the permit.

dump

wastes are assessed.

.4 modify the basis on which applications to dump

1 注入された二酸分段操作が、想定された海風下地質果園センタンが計画的に留まっているがを測定する、由 館臨視(影響仮館の後間と厚ばれる事がある)。

- .2 衝図された海底下地質駅層外への二酸化炭素流の移動 を検知及び測定するための、周辺地層の監視。
- .3 二酸化炭素流の海洋環境への漏洩や検知及び測定する| 成下地質界層を分断する廃坑井に特に留意するべきである。
- .4 二酸化炭蒸流の瀰洩が海洋生物に及ぼす影響を検知及 び御尻するための、 (属生性及び水柱の) 海洋生物群線

8.7 測定は、影響が予測されたとおりなどうかについて決定 その強値が強へなるいった、緊抗の強烈を減のヤニアだら 化炭紫流が海風下地質以層がの移動も つへは縮嵌しなど いだ中ない」という帰無仮既に揺んへものかめるも。口腰 **尽われる。多への場合、これのの測定は「顕著な変化は見** がりに関する情報を提供する調査によって得たもので対 海洋生物群集の監視は、処分の結果として起こる変化の拡 対応可能である。上部地層、海底とその上層水塊、及び、 するための、一道の年的間の競技を立成することによった れた数化の空間的規模が予想を超えていないことを把握 **へきるように数字されるへきためる。 狛<equation-block>照真は、子煎さ**

が検知されなければ、海洋生物群集の監視は不要であるかも い。同様に、二酸化炭素流の海底又はその土層水塊への源波 質尿圏の上部の塩層へ毎野ったこめにとが検知されない限 章に関して、繊鉛が進行中である:二酸化炭素流が海底下地 知れない。) り、海底及びその上層水域の監視は不要にあるかも知れな (鑑集注: 本

バーションの 8.7 頃

い

原が

だれてる、

ジ下の

又下の

マ

8.8 監視の結果(または他の関連調査の結果)は、その目的に服らして定期的に評価されるべきである。それにより、以 下の判断に係る基礎を提供することが可能となる。

- .1 現場での監視計画を変更、又は終了させる。
- . 2 許可を変更、又は取り消す。 処分場所を再設定、又は開鎖する

PERMIT AND PERMIT CONDITIONS

- 17 A decision to issue a permit should only be made if all minimized and the benefits maximized. Any permit requirements are determined. The provisions of the issued shall contain data and information specifying: impact evaluations are completed and the monitoring ensure, as far as disturbance and practicable, that detriment are
- .3 the method of dumping; and .4 monitoring and reporting requirements. .2 the location of the dump-site(s); .1 the types and sources of materials to be dumped:

- PERMIT AND PERMIT CONDITIONS
- 46 A decision to issue a permit should only be made if all environmental disturbance permit shall impact evaluations are completed and the monitoring requirements are determined. The provisions of the issued shall contain data and information specifying: minimized and the benefits maximized. Any permit ensure, as far as and practicable, that detriment are
- .2 the location of the dump-site(s); .1 the types, amounts and sources of materials to be
- .3 the method of dumping; and .4 monitoring and reporting requirements.
- 47 as alterations to the physical, chemical and biological compartments of the local environment is accepted by process. In granting a permit, the hypothesized impact the permitting authority. occurring within the boundaries of the dump site, such public review and participation in the permitting authorizing dumping must be issued in advance. It is If dumping is the selected option, then a permit opportunities are provided for
- Regulators should strive at all times to enforce procedures that will result in environmental changes far below the limits of allowable environmental

more difficult to remediate leaks through faults or commonly used in the oil and gas industry. migration or leakage on human health and the marine migration or the types and magnitudes of potential effects of such carbon dioxide streams will migrate or leak as well as management plan should consider the likelihood that response to migration or leakage, should be in place to enable a rapid and effective have no leakage, an environmental management plan Although the goal of disposal of carbon dioxide streams into sub-seabed geological formations is to geological formation. need to be transferred to a more suitable sub-seabed pathways, injection may need to cease or the CO2 may pressure in the formation or plugging the leakage fractures. If leakage can not be controlled by reducing remediate these wells will be similar to though an active or abandoned well, techniques to environment. authorities on the basis of the potential impact of the management lepending on the release scenario. If leakage occurs leakage. glan Management methods will ę, determined The requirements of the The environmental It may be national those γary

PERMIT AND PERMIT CONDITIONS

- 9.1 A decision to issue a permit should only be made if all practicable, that provisions of the permit shall ensure, as far as impacts, and a suitable risk management plan. The likelihood for migration and leakage and associated requirements are determined. impact evaluations are completed and the monitoring Any permit issued shall contain data and information detriment are minimized and the benefits maximized adequate site characterization, an assessment of the environmental disturbance and This includes an
- .1 purpose of the permit.
 .2 the types, amounts and sources of all materials in the carbon dioxide stream to be disposed into the sub-seabed geological formation;
- .3 the location of the injection facility and sub-seabed geological formation;
- 4 the method of carbon dioxide stream transport and 5 monitoring (both operational and long term) and reporting requirements.
- 9.2 If dumping is the selected option, then a permit authorizing dumping must be issued in advance. It is chemical and biological compartments of the local dump-site, such as alterations to the physical process. public review and participation in the permitting impact occurring within recommended that opportunities are provided for environment is accepted by the permitting authority. In granting a permit, the hypothesized the boundaries of the
- 9.3 Regulators should strive at all times to enforce procedures that will result in environmental changes as far below the limits of allowable environmental

に、そして、効果的な対応を可能にするために、 二酸化炭素流の海底下地質果層への処分の目的は、霧囱 り異なるだろう。もし強敵が現行抗井又は廃抗井を経由 機関により決定される。管理方法は、放出シナリオによ **緊張の移動及び繰波する可能性に加え、そのような移動 選軒回の製備が必要なめる。 製裁管理軒回は、二製化汞** を生いないことがはあるが、参覧や議費に対して早島 することなる取りめるかもおだない。 するか、二酸化炭素をより適切な海底下地質界層へ参数 **遠縄路の磨開によって制御できない場合は、狂入を中止** あるかも知れない。もし瀰波が、緊層内の圧力低波や漢 ス庫業で一般的に使用される技術と類似しているだろ 及び漏洩による潜在的影響の種類や規模も考慮すべき ためる。管理学画に展求される事項は、参野や溢泡が14 う。新層や割ち目がちの譲渡の御彼は、いれより困難や **したいる場合、いちらの汽井や療領する技術は、石油ガ** トの健康や海洋環境に及ぼや潜在的影響や場で、各国の

9 許可及び許可条件

- 9.1 評可を発給する決反は、適切なサイト特性の把握、移動 及び譲渡の可能性及びそれに伴う影響の評価、そした、適切なリスク管理計画を含むすべての影響評価が完了し及 び騒視硬件が決定される場合のみ、行われるべきである。 らにしなければならない。発給されたすべての軒可には、 次の事項に関するゲーク及び情報が明確に示されていな び障害を最小化しつし、環境に対する利益を最大化するよ 許可銘給にめたられば、実現可能な限り、環境への優審及 けれならない。
- 1 野国の国的
- .2 海底下地中駅層へ処分される二酸七炭染流に含まれる全人の物質の種類、量及び発生額
- .8 注入施設及び海底下地中累層の位置
- 4 二酸化炭素流の輸送方法
- .5(換業中及び長期の両方の)監視及び報告の要件
- 9.2 投業を選択する場合には、あらかじめ軒可を受けなけれ 内で超ごる影響の仮説(同地域の環境の物理的、化学的及び生物学的区分の変化等)は、許可審査の過程で許可官庁 加のための機会が設けられることが推奨される。投業場所 江谷のない。許回の勝角過極江江市民ごよる勝角および移

18 Permits should be reviewed at regular intervals, marine environment. of permits. This provides an important feedback mechanism for the protection of human health and the objectives of monitoring programmes. Review of monitoring results will indicate whether field taking into account the results of monitoring and the regarding the continuance, medification or revocation programmes need to be continued, revised or terminated and will contribute to informed decisions 49

change as practicable, taking into account technological capabilities as well as economic, social and political concerns.

regarding the continuance, modification or revocation of permits. This provides an important feedback mechanism for the protection of human health and the objectives of monitoring programmes. Review of programmes need to be continued, revised or Permits should be reviewed at regular intervals, taking into account the results of monitoring and the terminated, and will contribute to informed decisions monitoring results will indicate whether field

and political concerns.

9.4 Permits should be reviewed at regular intervals, taking into account the results of monitoring and the objectives of monitoring programmes. Review of monitoring results will indicate whether field programmes need to be continued, revised or regarding the continuance, modification or revocation of permits. This provides an important feedback mechanism for the protection of human health and the terminated, and will contribute to informed decisions marine environment.

change as practicable, taking into account technological capabilities as well as economic, social

9.3 規制当局は、経済的、社会的、政治的事情及び技術力を 考慮に入れて、環境変化ができるかざり許される環境変 化の限界を下回る結果となるように常に努めななければ。 ならない。

9.4 許可は、監視結果及び監視計画の目的を考慮し、定期的に見直されるべきである。監視結果の放討は、現地における計画を継続するべきか、見直すべきか、又は終結するべ の知識を要する決定に貢献する。これは、人の健康及び海洋環境を保護するための重要なフィードバック制度を提供する。 者が格指示し、また、評国の織錦、揆以又は廃止にしいた

