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FINAL REPORT

Specific contract N° SI2.ACPROCE026368000 under Framework Contract N° ENTR/04/093 Lot 5 - SME Test Study and IA on possible options for reviewing the Directive 97/68/EC relating to NRMM

European Commission – DG ENTR

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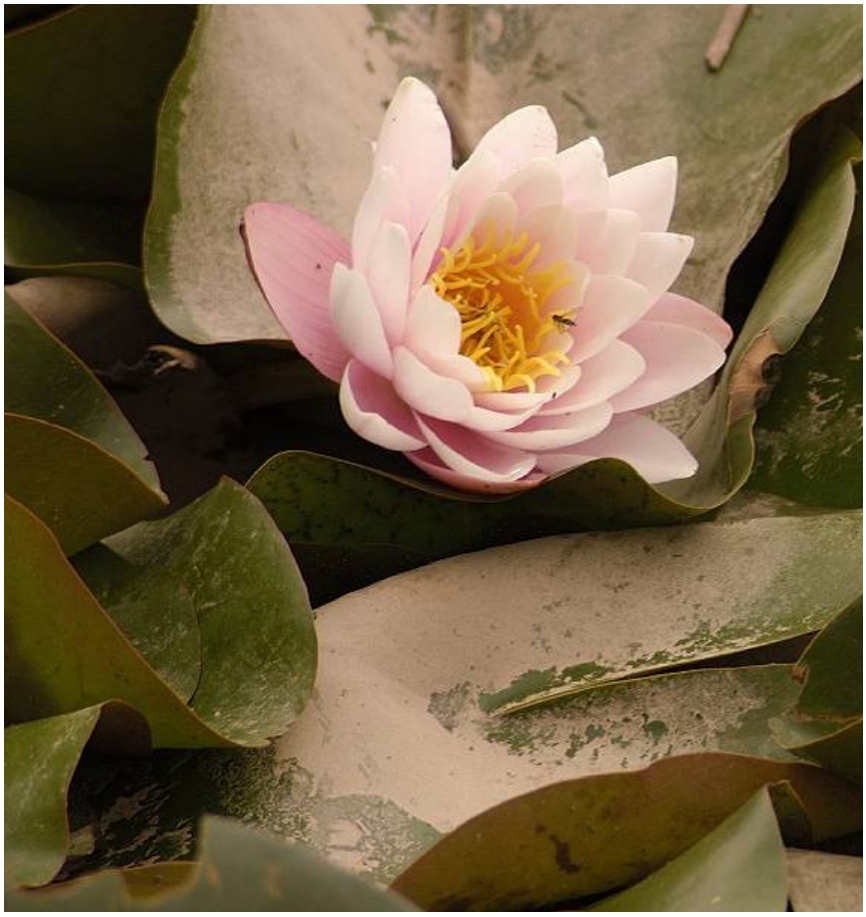

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Specific contract N° SI2.ACPROCE026368000 under Framework Contract N° ENTR/04/093 Lot 5 - SME Test Study and IA on possible options for reviewing the Directive 97/68/EC relating to NRMM

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LIST OF ABBREVIATIONS

ABT	Average trading and banking system used in the US
CCNR	Central Commission for Navigation on the Rhine
CECE	Committee for European Construction Equipment
CEMA	European Committee of associations of manufacturers of Agricultural Machinery
CEMR	Council of European Municipalities and Regions
CI engine	compression ignited engine or diesel engine
COPA-COGECA	Committee of Professional Agricultural Organisations - General Confederation of Agricultural Cooperatives
Cost pass through	Percentage of the cost increases incurred by a manufacturer that he will pass through to his suppliers (upstream pass through) or customers (downstream pass through)
DPF	diesel particulate filter
EBTP	European Business Test Panel
ECOS	European Environmental Citizens' Organisation for Standardisation
EGMF	European Garden Machinery industry Federation
EGR	Exhaust gas recirculation
Elasticity of demand	The percentage change in quantity demanded as per the percentage change in the price of the same commodity
ELCA	European Landscape Contractors Association

ENFE	European Network of Forest Entrepreneurs
EU-Nited	European Engineering Industries Association
Euromot	European Association of Internal Combustion Engine Manufacturers
Externality	An externality occurs when an economic activity causes external costs or external benefits to third party stakeholders who did not directly affect the economic transaction.
FEM	European Federation of Materials Handling
FIEC	European Construction Industry Federation
GDP	Gross domestic product
HC	Hydrocarbon
IA	Impact Assessment
IMO	International maritime organization
ISMA	International Snowmobile Manufacturers Association
IWT	Inland waterway transport
IWW	Inland waterways
kW	kilo Watt
Modal share	Modal share, describes the percentage of transport users using a particular type of transportation. For example, if 85% of all transport users use cars (passenger) or heavy duty vehicles (goods) to get from A to B, while 15% use the train. Then the railway c transport modal share is 15% while the motor vehicle modal share is 85%.
NO_x	Nitrogen oxide referring to any binary compound of oxygen and nitrogen, or to a mixture of such compound. NO_x react with volatile organic compounds in the presence of heat and sunlight to form Ozone.
Opportunity cost	The opportunity cost is the value of the next best alternative foregone as the result of making a decision
ORGALIME	European Engineering Industries Association representing the interests of the Mechanical, Electrical, Electronic, Metalworking & Metal Articles Industries

PM	Particulate matter (PM) or fine particles, are tiny particles of solid or liquid suspended in a gas. Human activities, such as the burning of fossil fuels in vehicles, power plants and various industrial processes generate significant amounts of particles. Increased levels of fine particles in the air are linked to health hazards such as heart disease, altered lung function and lung cancer.
Pneurop	European Committee of Manufacturers of Compressors, Vacuum Pumps, Pneumatic Tools and Air & Condensate Treatment Equipment
R&D	Research and development
Railcar	A railcar is a self-propelled railway vehicle designed to transport passengers.
SCR	Selective catalytic reduction.
Secondary engine	Secondary engines are defined in Directive 2002/88/EC as engines installed in or on a motor vehicle, but not providing motive power to the vehicle.
SI engine	spark ignited engine or gasoline engine
SME	Small or medium enterprise
Snow groomers	Self-propelled crawler machines used to extent a push or pull force on snow and ice through mounted equipment
Snowmobile	Land vehicle propelled by one or two rubber tracks, with skis for steering
Sunk cost	Costs that cannot be recovered once they have been incurred.
UEAPME	European Association of Craft, Small and Medium Enterprises
Ultra low sulphur diesel	standard for defining diesel fuel with substantially lowered sulphur contents
VDMA	German Engineering Federation

EXECUTIVE SUMMARY

The aim of this study was to complement the existing Impact Assessment study related to Directive 97/68/EC (as amended) with a detailed assessment of the impacts the identified policy options may have on SMEs.

The low number of SMEs that were identified in the course of the study is probably due to the very stringent criteria that the Commission uses to define SMEs. Also, for SMEs, the burden of responding actively to the questionnaire is often very high. This is certainly the case for professional end users. However, a less restrictive definition of SMEs would ignore two essential problems of SMEs that are solved with mergers and acquisitions (high fixed costs and difficult access to capital).

The most important policy conclusions are:

- In some cases, large manufacturers are close to finding technical solutions to comply with the next stages in the Directive while the SMEs are unlikely to develop compliant equipment on their own and will have to pay for licenses. This will put SMEs at a cost disadvantage compared to larger companies.
- Small OEMs are not always aware of the implications of the Directive on their business.
- Virtually all OEMs have expressed concerns with respect to the rapid succession of emission stages (rather than the absolute values of the imposed emission limits). This affects their business negatively through the following channels: (a) shorter production runs to cover fixed costs (b) the costs linked to teething problems of new equipment.
- The most important concern raised by producers of agricultural machinery was the homologation process of their equipment rather than the NRMM Directive itself.
- Because the NRMM Directive only applies to new engines, it effectively increases the cost of replacing old engines by new ones. This can lead to a postponement of the decision to replace these old (more polluting) engines. Moreover, this will come at the price of increased maintenance and operation costs.
- In some cases, it would be possible to subsidise the purchase of new engines without exceeding the *de minimis* limits for state aid. In these cases, the burden of compliance costs will effectively be shared between taxpayers and the professional end users.
- In some sectors, significant *direct* environmental benefits could be obtained from accelerating the replacement of old engines. However, it would be necessary to evaluate the indirect environmental impact of engine production and scrapping.
- If future legislation would also take into account CO_2 emissions, then consistency would require to also take into account the impact on other greenhouse gasses.
- The fuels used in operational conditions are not always the same as the fuel used during the testing of engines for type approval. It is not clear to what extent the real-life emissions of an engine correspond to the emissions measured during the testing.

A more flexible application of the small volume derogation would yield benefits for the manufacturing industry, but at the cost of a (probably small) environmental impact. The main problem with the small volumes derogation is its enforcement.

The flexibility scheme for CI engines offers following advantages:

- Overcome R&D peaks when several products are faced with stricter emission limits:
- Allow SMEs to skip the teething problems of new engines.

- Allow small equipment manufacturers to overcome the time lag between the development of a new engine and the full integration of this new engine in the equipment;

ZUSAMMENFASSUNG

Das Ziel dieser Studie war die Ergänzung der bestehenden Folgenschabschätzungsstudie in Bezug auf die Richtlinie 97/68/EG (gemäß Abänderung) mit einer detaillierten Beurteilung der Auswirkungen, welche die identifizierten Optionen der Richtlinie möglicherweise auf KMUs haben könnten.

Die geringe Anzahl an KMUs, die im Laufe der Studie identifiziert wurden, ist wahrscheinlich auf die sehr strengen Kriterien zurückzuführen, welche die Kommission zur Definition von KMUs anwendet. Zudem ist für KMUs auch die Bürde, den Fragebogen aktiv zu beantworten, häufig sehr hoch. Dies ist sicherlich der Fall für professionelle Endbenutzer. Allerdings würde eine weniger restriktive Definition von KMUs zwei wesentliche Probleme von KMUs unberücksichtigt lassen, die mit Fusionen und Firmenübernahmen gelöst werden (hohe Fixkosten und schwieriger Kapitalzugang).

Die wichtigsten Schlussfolgerungen der Richtlinie sind:

- In einigen Fällen sind große Produzenten nahe daran, technische Lösungen zu finden, um den nächsten Stufen der Richtlinie zu entsprechen, während es für KMUs unwahrscheinlich ist, dass sie selbst konforme Ausrüstung entwickeln können und sie Lizenzen bezahlen müssen. Dies bedeutet einen Kostennachteil für KMUs im Vergleich zu großen Unternehmen.
- Kleine Originalhersteller (OEM) sind sich der Auswirkungen der Richtlinie auf ihr Geschäft nicht immer bewusst.
- Praktisch alle OEMs haben Bedenken im Hinblick auf die rasche Aufeinanderfolge der Emissionsstufen geäußert (eher als bezüglich der absoluten Werte der auferlegten Emissionsgrenzen). Dies beeinträchtigt ihr Geschäft negativ durch folgende Kanäle: (a) kürzere Produktionsserien zur Deckung von Fixkosten (b) die Kosten im Zusammenhang mit Anlaufschwierigkeiten neuer Ausrüstung.
- Die größte Besorgnis, die von Produzenten landwirtschaftlicher Maschinen vorgebracht wurde, war das Zulassungsverfahren ihrer Ausstattung und nicht die NRMM-Richtlinie selbst.
- Weil die NRMM-Richtlinie nur für neue Motoren gilt, erhöht sie effektiv die Kosten für den Austausch alter Motoren durch neue. Dies kann zu einer Verschiebung der Entscheidung zum Austausch dieser alten (umweltschädlicheren) Motoren führen. Darüber hinaus wird dies zum Preis erhöhter Wartung und Betriebskosten erfolgen.
- In einigen Fällen wäre es möglich, den Kauf neuer Motoren zu subventionieren, ohne die *minimis*-Grenzen für staatliche Unterstützung zu überschreiten. In diesen Fällen wird die Last der Konformitätskosten effektiv zwischen Steuerzahlern und den professionellen Endbenutzern geteilt.
- In einigen Sektoren könnten erhebliche *direkte* Umweltvorteile durch die Beschleunigung des Austauschs von alten Motoren erzielt werden. Allerdings wäre es notwendig, die indirekten ökologischen Auswirkungen der Motorproduktion und Verschrottung zu bewerten.
- Wenn die künftige Gesetzgebung auch die CO_2-Emissionen berücksichtigen würde, würde die Konsistenz auch die Berücksichtigung der Auswirkungen auf andere Treibhausgase erfordern.
- Die in betrieblichen Bedingungen verwendeten Kraftstoffe sind nicht immer dieselben wie die Kraftstoffe, die während der Tests der Motoren für die Bauartgenehmigung

verwendet werden. Es ist nicht deutlich, in welchem Ausmaß die echten Emissionen eines Motors den während der Tests gemessenen Emissionen entsprechen.

Eine flexiblere Anwendung der Ausnahme kleiner Volumen würde Vorteile für die Fertigungsindustrie bringen, aber auf Kosten einer (wahrscheinlich geringen) ökologischen Wirkung. Das Hauptproblem bei der Ausnahme kleiner Volumen ist die Vollstreckung.

Der Flexibilitätsplan für CI-Motoren bietet folgende Vorteile:

- Bewältigung von F&E-Spitzen, wenn mehrere Produkte strengeren Emissionsgrenzen unterliegen:
- Ermöglichung für KMUs, die Anlaufschwierigkeiten neuer Motoren zu überspringen.
- Ermöglichung für Hersteller kleiner Ausrüstung, den zeitlichen Abstand zwischen der Entwicklung eines neuen Motors und der vollständigen Integration dieses neuen Motors in der Ausrüstung zu bewältigen.

DOCUMENT DE SYNTHESE

L'objectif de cette étude consistait à complémenter l'étude existante destinée à évaluer l'impact lié à la Directive 97/68/CE (telle qu'elle a été amendée) par une évaluation détaillée des impacts que pourraient exercer les options politiques identifiées sur les PME.

Le faible nombre de PME identifiées dans le cadre de cette étude est probablement dû aux critères particulièrement étroits que manie la Commission pour définir les PME. La charge que représente une réponse active au questionnaire est souvent très élevée pour une PME. Ceci est certainement le cas pour les utilisateurs finaux professionnels. Une définition moins restrictive de la PME ignorerait cependant deux problèmes essentiels des PME qui sont solutionnés par le biais de fusions et d'acquisitions (les frais fixes élevés et les difficultés d'accéder au capital).

Les conclusions politiques les plus importantes sont les suivantes :

- Dans certains cas, les fabricants importants sont en mesure de trouver des solutions techniques qui leur permettent de se conformer aux phases suivantes de la Directive, tandis que les PME sont rarement en mesure de développer eux-mêmes des équipements conformes et devront donc payer pour obtenir des licences. Cette situation représentera un désavantage pour les PME en comparaison des sociétés plus importantes.
- Les petits équipementiers n'ont pas toujours conscience des implications de la Directive sur leurs activités.
- Pratiquement tous les équipementiers ont formulé des préoccupations en ce qui concerne la succession rapide des phases d'émission (plutôt qu'à propos des valeurs absolues des limites d'émission imposées). Ceci exerce un effet négatif sur leurs activités dans deux domaines : (a) des cycles de production plus courts devant couvrir les frais fixes, et (b) les coûts liés aux problèmes des « maladies d'enfance » des nouveaux équipements.
- La plus importante préoccupation soulevée par les producteurs de machines agricoles est le processus d'homologation de leurs équipements, plus que la Directive NRMM même.
- Compte tenu du fait que la Directive NRMM s'applique exclusivement aux nouveaux moteurs, elle amplifie effectivement le coût du remplacement des anciens moteurs par de nouveaux exemplaires. Cette situation pourrait déboucher sur le report de la décision de remplacement de ces anciens moteurs (plus polluants). Une telle décision se traduirait en outre par une augmentation des coûts d'entretien et des coûts opérationnels.
- Dans certains cas, il serait possible de subsidier l'achat de nouveaux moteurs sans dépasser les limites *minimis* des aides gouvernementales. Dans certains cas, la charge que représente le coût de mise en conformité sera en effet partagée par les contribuables et les utilisateurs finaux professionnels.
- Dans certains secteurs, des avantages environnementaux *directs* significatifs pourraient être obtenus en accélérant le remplacement des anciens moteurs. Il serait cependant nécessaire d'évaluer l'impact environnemental indirect de la production du nouveau moteur et de la mise à la ferraille de l'ancien.

- Si une future législation devait aussi prendre les émissions de CO_2 en compte, la cohérence voudrait que nous prenions aussi en compte l'impact sur d'autres gaz à effet de serre.
- Les carburants utilisés dans les conditions d'exploitation ne sont pas toujours les mêmes que ceux qui ont été utilisés dans le cadre des tests imposés aux moteurs en vue de leur approbation. On ignore dans quelle mesure les émissions réelles d'un moteur en cours d'exploitation correspond aux émissions mesurées à l'occasion des tests.

Une application plus flexible de la dérogation pour petits volumes se traduirait par des avantages pour les fabricants, mais au prix d'un impact environnemental (probablement limité). Le principal problème concernant la dérogation pour petits volumes réside dans son application forcée.

Le schéma de flexibilité pour les moteurs CI offre les avantages suivants :

- il permet de surmonter les pics en matière de R&D lorsque plusieurs produits sont confrontés à des limites d'émission plus strictes.
- il permet aux PME de sauter les problèmes des « maladies d'enfance » des nouveaux moteurs.
- il permet à de modestes fabricants d'équipements de surmonter le délai s'écoulant entre le développement d'un nouveau moteur et son intégration dans l'équipement;

EXTENDED EXECUTIVE SUMMARY

The aim of this study was to complement the existing Impact Assessment study related to Directive 97/68/EC (as amended) with a detailed assessment of the impacts the identified policy options may have on SMEs.

We have focused our research on the following categories of stakeholders:

- the manufacturers of engines, equipment and components
- professional end users of the equipment.

Based upon the results of the IA study, there was no indication that other SMEs are affected significantly by this Directive. Therefore, in our proposal, we had proposed that the focus of the study would be on these categories.

The most striking conclusion of this study is that, despite the very important efforts undertaken by the project team, less than 10 individual OEMs (abstracting from the shipbuilders) have been identified unequivocally as SMEs and have contributed actively to the study.

The number of SMEs identified amongst professional end users was much higher, but really new information was only provided by the following sectors: independent winegrowers, cableway and ski lift operators, and by the inland waterways sectors.

There are several possible explanations to the large difference with previous estimates of the number of SMEs:

- The discrepancy between the Commission's definition of SMEs and the public perception of what an SME is.
- SMEs feel that their specific interests are not always well represented by the sector federations. Therefore, we have also used alternative communication channels but this has resulted in very limited response rates as well.
- For SMEs, the burden of responding actively to the questionnaire is often too high compared to the (perceived) benefits of doing so. This is certainly the case for professional end users.

However, if a less restrictive definition of SMEs would be used in future work, this would ignore two essential problems of SMEs that are solved with mergers and acquisitions (high fixed costs and difficult access to capital). Moreover, a change of the scope of the definition could lead to confusion on the side of the industry.

Allowing longer response times could lead to a slightly higher response rate, but, in this study, the extension of the contract has not had a significant impact on the actual response rate. Drafting a questionnaire in several languages (or allowing SMEs to answer in their mother tongue), would have huge implications in terms of translation budget and in execution time. Finally, there are limits to how far we can go in simplifying the questionnaires without missing the whole point of the study.

The most important **policy conclusions** are:

- If the current exemption for the stage II emission limits for tree service chainsaws and hand held hedge trimmers would not be extended, this would affect the professional end user market, which is mostly composed of small business. However, there are no reasons to revise the conclusions that were already reached in the IA study.
- Some large manufacturers are close to finding technical solutions for stage II for tree service chain saws and hedge trimmers. SMEs are unlikely to develop compliant

equipment on their own and will have to pay for licenses, which will put them at a significant cost disadvantage compared to larger companies who own the intellectual property rights. Further exit from the market is likely. The number of jobs at risk at the EU level would lie between the 100 and 200 units.

- In the case of snowmobiles, the only SMEs affected are dealers and the professional end users. We have identified no information that significantly changes the conclusions of the original IA study.
- We have identified no SMEs amongst the OEM of construction and agricultural machinery < 19 kW and > 560 kW.
- Virtually all OEMs that have been interviewed in the course of the study have expressed concerns with respect to the rapid succession of emission stages (rather than the absolute values of the imposed emission limits). This affects their business negatively through the following channels: (a) shorter production runs to cover fixed costs (b) the costs linked to teething problems of new equipment.
- The most important concern raised by producers of agricultural machinery was not the next stage in the Directive, but the homologation process, and more specifically: the length of this process, the lack of international standardisation and the fact that even minor changes require rerunning a complete homologation process.
- Regarding the impact of the Directive on tractors used in orchards, no information has been obtained from the relevant professional organisation of end users. Regarding the impact on tractors used in vineyards, the European sector federation has confirmed that all independent winegrowers are SMEs, and the vast majority are micro-enterprises. Our calculations indicate that:
  - the cost for redesigning vineyards to accommodate stage IIIB and IV compliant tractors would be several orders of magnitude larger than the environmental cost of *not* exempting the special tractors from stage IIIB and IV;
  - the increased maintenance cost following from keeping old tractors in use would be an order of magnitude larger than the environmental cost of *not* exempting the special tractors from stage IIIB and IV.
- The professional end users of snow groomers are all SMEs. If stage IIIB would be introduced according to the existing time schedule, operators are likely to cover the transition period to stage IV by keeping their existing snow groomers in use beyond their economic lifetime. This would come at the cost of increased maintenance and operating costs that are about 5 times as high as the increase in purchasing costs when a snow groomer is equipped with an SCR.
- In the IWT sector, all markets downstream of the engine manufacturers (dealers, shipbuilders, ship-owners) are clearly dominated by very small enterprises. The sector itself has indicated that it expects that the current recession will be followed by an important catching up. It is therefore likely that the first engines complying with the stage IIIB standards will be put on the market after the end of the downturn. By that time, access to capital should have improved as well.
- As about half of the investment cost linked to the CCNR stage IV proposal could be subsidised without exceeding the *de minimis* limits for state aid, it is possible that, in practice, the burden of compliance costs will effectively be shared between taxpayers and the IWT sector.
- Some small rail freight operators fall within the definition of SMEs, but we have identified no information that changes the conclusions of the original IA study.

In the case of the **IWT sector**, we have also indentified the following issues that are independent of the SME test:

- Because the NRMM only applies to new engines, it effectively increases the cost of replacing old engines by new ones. This can lead to a postponement of the decision to replace these old engines.
- Significant direct environmental benefits could be obtained from accelerating the replacement of old engines, at a cost which would be lower than the cost of complying with the CCNR stage IV proposal. However, before firm policy conclusions on this issue can be drawn, it would be necessary to evaluate the environmental impact of engine production and scrapping.
- Cold ironing has potential as a cost-effective emission reduction strategy for ships at berth.
- If future legislation would also take into account CO_2 emissions, then consistency would require to also take into account the impact on other greenhouse gasses, such as black carbon and tropospheric ozone , which are linked to PM and NOx bertemissions.
- The fuels used in operational conditions are not always the same as the fuel used during the testing of engines for type approval. It is not clear to what extent the real-life emissions of an engine correspond to the emissions measured during the testing.

This study has considered the two following generic **mitigating measures**:

- More flexibility in the current small volumes derogation for SI engines.
- An increase in the number of engines that could be put on the market under the flexibility scheme for CI engines.

A more flexible application of the small volume derogation would yield benefits for the manufacturing industry, but at the cost of a (probably small) environmental impact. In contrast, in the ABT scheme used in the US, the environmental effect is neutral when averaged over time and space, while the system also yields benefits in terms of reduced compliance costs. The main problem with the small volumes derogation is that this system can only work if it is sufficiently enforced.

With respect to flexibility scheme for CI engines, we have identified the following additional advantages on top of the advantage already identified in the IA study (flexibility allows to overcome R&D peaks when several products are faced simultaneously with stricter emission limits):

- An increase in the fixed number of engines allowed on the market under the flexibility scheme would allow SMEs to completely skip the teething problems of new engines.
- An extension of the duration of the flexibility scheme would allow small equipment manufacturers to overcome the long time lag between the development of a new engine and the full integration of this new engine in the equipment (including homologation for use on the road);

Most OEMs that we have interviewed are aware of the flexibility scheme, but not all seem keen on using it. One manufacturer has raised the specific concern that the engine

suppliers may not always be able to supply engines complying with the previous stage of the Directive[1].

[1] In some applications, engine manufacturers keep on producing engines complying only with previous stages of the Directive, but these engines are exported to unregulated regions of the world. We have to keep in mind that in niche markets, this outlet of exports outside the EU does not necessarily exist.

1 Introduction

The aim of this study is to complement the existing Impact Assessment study related to Directive 97/68/EC (as amended) with a detailed assessment of the impacts the identified policy options may have on SMEs.

The **purpose** of **Directive 97/68/EC** is to approximate the laws of the Member States with regard to:

- **emission standards**;
- **type-approval procedures** for engines intended to be fitted to **non-road mobile machinery**.

Non-Road Mobile Machinery (NRMM) covers a large variety of engine installations in machines used for purposes other then for passenger or goods transport.

Diesel and spark emission engines installed in these NRMM such as excavators, bulldozers, front loaders, back loaders, compressors contribute to air pollution by emitting carbon oxide (CO), hydrocarbons (HC), nitrogen oxides (NOx) and particulate matters. In line with the EU environmental policy it is the objective to progressively reduce the emissions and to phase out polluting equipment[2].

For the various types of NRMM, the Directive stipulates the maximum permitted exhaust emissions as a function of the power of the relevant engine. Moreover the Directive includes a series of emission limit stages of increasing stringency with corresponding compliance dates. Manufacturers must ensure that new engines comply with these limits in order that they can be placed on the market.

This final report is structured as follows. In Chapter 2, we give an overview of the background and our understanding of the project. Chapter 3 contains the methodology for all tasks that are required for the fulfilment of the project. We cover both the methodology we had proposed and how we have adapted it in face of changing circumstances. Chapters 4 to 11 contain the results of the study, following the same structure as in the IA study. Chapter 12 concludes.

[2] http://ec.europa.eu/enterprise/sectors/mechanical/non-road-mobile-machinery/index_en.htm

2 Background

2.1 Key concepts in Directive 97/68/EC

For the purposes of the Directive:

- "**non-road mobile machinery**" (henceforth "**NRMM**") means any mobile machine, transportable industrial equipment or vehicle with or without bodywork that is not intended to be used to carry goods or passengers on the road, in which an internal combustion engine (as specified in Annex I, Section 1 of the Directive) is installed, for example excavators and other construction equipment. This definition to cover locomotives and inland waterway vessels has been extended by Directive 2004/26/EC;
- "**type approval**" means the procedure whereby a Member State certifies that an internal combustion **engine type** or **engine family** meets the relevant technical requirements of the Directive with regard to its level of emission of gaseous and particulate pollutants;
- "**engine type**" means a category of engines which do not differ in such essential engine characteristics as specified in Annex II, Appendix 1 of the Directive;
- "**engine family**" means a manufacturer's range of engines which, as a result of their design, are expected to have similar exhaust-emission characteristics and which comply with the requirements of the Directive.

The procedure for **type-approval** for engine types or families can be summarized as follows:

- Any application for EC type approval must be submitted by the manufacturer to the approval authority in a Member State. The application should be accompanied by a manufacturer's information folder. No application in respect of one engine type or engine family may be submitted to more than one Member State;
- The Member State receiving the application must grant type approval to all engine types or engine families which conform to the particulars in the information folder and which meet the requirements of Directive 97/68/EC;
- An approval certificate must be issued for each engine type or family that has been approved;
- Each month, the competent authorities in each Member State must send to their counterparts in the other Member States a list of the type approvals by type or family of engine which they have granted, refused or withdrawn during the month in question (Article 4);
- Any request for amendment or extension of a type approval is to be submitted exclusively to the Member State which carried out the original type approval (Article 5).

Member States may not refuse the registration or placing on the market of new engines which meet the requirements of the Directive (Article 8).

From 30 June 1998 onwards Member States may not refuse to type approve an engine type or family, and may not impose additional approval requirements relating to pollutant

emissions if the engine in question meets the conditions laid down in the Directive (Article 9).

The provisions of Article 8 and 9 do not apply:

- to engines used by the armed forces;
- to engines taken from stocks of end-of-line engines or non-road mobile machinery covered by an exemption under Article 10(2).

Member States are required to provide the Commission with a list of the exemptions granted and the reasons given.

Member States must guarantee that conformity of production is checked effectively before type approval is granted (Article 11).

Engines not meeting the conditions set out in the approval certificate are considered not to conform to the type or family that has been approved. The Member State conducting type approval must take any action needed to ensure that engines in production conform.

2.2 The Directive and its amendments

Directive 97/68/EC (hereafter 'NRMM Directive') recognizes as a fundamental principle - in relation to the environment and sustainable development - that all persons should be effectively protected against recognized health risks from air pollution and that this necessitates in particular the control of emissions of NO2, particulates (PT) – black smoke and other pollutants (CO, NOX, HC, e.a.). It also aims at establishing the internal market by harmonizing the laws between Member States, with the protection of environment and health as main objective.

The initial NRMM Directive adopted in 1997 covered only compression ignition (CI) engines for land based applications only, and introduced emission limit STAGES I & II for such engines.

The first amendment, Directive 2002/88/EC, enlarged the scope of application to spark ignition (SI) gasoline-fuelled engines up to 18 kW, as they are commonly used in lawn and garden machines (hedge trimmers, brush cutters, lawnmowers, garden tractors, snow blowers, etc.), in light-duty industrial machines (generator sets, welders, pressure washers, etc.) and in light logging machines (chainsaws, log splitters, shredders, etc.), and introduced emission limit stages I & II for these engines.

With a second amendment, Directive 2004/26/EC, engines for Inland Waterway Vessels (IWWV) and for railcars and locomotives were added to the scope of the Directive. That amendment also introduced more stringent emission limit values of exhaust emissions through new emission limit stages for engines already covered by the Directive, which depending on the type of machinery are entering into force following different timetables, the latest by the year 2014. These new emission limit stages are referred to as IIIA, IIIB and IV.

For every type of the engine and machinery covered by the Directive and its amendments, measurement procedures, operating and testing conditions are described in the Directive as well.

The need for considering the inclusion of emission limits for snow groomers and snowmobiles (or snow scooters) are specifically addressed in Article 3 (b) of Directive 2002/88/EC.

Agricultural tractors are covered by European Parliament and Council Directive 2000/25/EC (referring mainly to Directive 97/68/EC) and Commission Directive

2005/13/EC (with a link to Directive 2004/26/EC), in which exhaust emission limits are specified. The classification of agricultural tractors is ruled by Directive 2003/37/EC.

2.3 Previous study work

The Commission has to deliver to the European Parliament and Council a technical review as described in Article 3 of Directive 2002/88/EC and Article 2 of Directive 2004/26/EC. All the elements addressed in these articles have to be taken into consideration and, where appropriate, proposals for amending the Directive have to be elaborated. The technical work related to this review has been carried out by DG Joint Research Centre (DG JRC).

The Technical Review, as presented by DG JRC in its final report of September 2008, has resulted in the following possible options for addressing the elements specified in the review clauses of Directives 2002/88/EC and 2004/26/EC.

- Option 0: 'no action option' – retain of the status quo, i.e. no changes to the scope and emission limit stages of the NRMM Directive
- Options 1,2,.,n: possible policy options identified by JRC

Under the Specific Contract No SI2.ACPROCE018014400, signed on 30-4- 2008 and amended on 15-12-2008, ARCADIS Belgium and *Transport & Mobility Leuven* have submitted these identified options to a detailed impact assessment study (henceforth "the IA study"), addressing technical, social, environmental, and economical aspects. The Commission services have judged that the included analysis, conducted on the distributive effects on SMEs, is not sufficient to serve as a basis for successfully running the SME test as specified in the Commission's updated Impact Assessment Guidelines of 2009. This is the motivation for the current study.

2.4 The SME test

The Impact Assessment study was carried out in compliance with the Commission Guidelines and Annexes on Impact Assessment in force at the time (version of 15 March 2005). As of 15th of January 2009, a new updated version of Commission Guidelines with Annexes on Impact Assessment (SEC(2009) 92) is in force, requiring a more extended and detailed assessment of impacts related to SMEs.

We give here a brief overview of the "SME test" as it is required in the IA Guidelines.

The Guidelines require to take SME's into consideration in each of the analytical steps when carrying out an impact assessment.

The following steps are distinguished:

Consultation with SMEs representatives. The guidelines provide examples of possible good practices: round table discussions with stakeholders, test panels of entrepreneurs, specific committees, use of IT tools (on-line consultations, forum)… The Guidelines include also suggestions for consulting SME stakeholders with the support of DG ENTR, such as inviting SMEs representatives to stakeholder hearings, the use of the Enterprise Europe Network and the European Business Test Panel (EBTP).

Preliminary assessment of businesses likely to be affected. The objective of this stage is to establish whether SMEs are among the affected population and to identify the characteristics of the businesses/sector(s) likely to be affected. If the preliminary assessment leads to the conclusion that SMEs are amongst the affected parties, the guidelines require further analysis to be carried out.

Measurement of the impact on SMEs. The distribution of the potential costs and of the benefits of the proposals with respect to the business size, differentiating between micro, small, medium and large enterprises should be analysed qualitatively and, *if possible and proportionate*, quantitatively. Cost and impacts identified for SMEs have to be compared with those of large enterprises.

Assess alternative options and mitigating measures If the abovementioned cost/benefit analysis shows that SMEs are facing a relatively higher burden, the IA Guidelines suggest to consider the use of SME specific measures in order to ensure a level playing field and the respect of the proportionality principle. When the analysis made under the previous section shows that SMEs are disproportionately affected or disadvantaged compared to large companies, the Guidelines require considering using possible mitigating measures. The Guidelines include a non-exhaustive list of measures to be considered, but clearly state that the choice of specific measures to use will be made on a case by case basis.

3 Approach

3.1 Review of the IA study

The results of the IA study have been used to identify any issues that may be relevant to SMEs and that need further deepening. As the current SME test builds upon the IA study, this study keeps the NRMM sectors of the IA study:

- Small SI engines
- Snowmobiles
- CI engines for construction and agricultural machinery
- CI engines for special agricultural tractors used in vineyards and orchards
- Inland waterway transport
- Locomotives and railcars

Based upon the results of the IA study, our proposal for this project had proposed that the study focuses on:

- for small SI engines: engine and equipment manufacturers, but mostly on the professional end users;
- for snowmobiles: only the dealers, the professional users (reindeer owners) and the services supporting tourist activities (hotel industry etc).
- CI < 19 kW: despite intense consultation with the industry during the IA study, no information had been obtained for this market segment, neither on the producer nor on the user side, that would allow for an appreciation of the effects on SMEs
- CI > 560 kW: despite intense consultation with the industry during the IA study, no information had been obtained for this market segment, neither on the producer nor on the user side, that would allow for an appreciation of the effects on SMEs;
- CI flexibility: despite intense consultation with the industry, no information had been obtained for this market segment, neither on the producer nor on the user side, that would allow for an appreciation of the effects on SMEs
- special agricultural tractors: SMEs are important, both at the producer and at the user side
- snow groomers: cableway and ski lift operators
- IWW: most IWT companies are SMEs
- Railways: both the producers and the end users are large companies; however, some private freight operators could be SMEs

As will become apparent later in this text, during the execution of the project, information has become available that has led us to revise some of these assumptions.

3.2 Identification of the relevant target group

We have focused our research on the following categories of stakeholders:

- the manufacturers of engines, equipment and components
- professional end users of the equipment.

Based upon the results of the IA study, there was no indication that other SMEs are affected significantly by this Directive. Therefore, in our proposal, we had proposed that the focus of the study would be on these categories.

The following associations have been contacted within one week after the signature of the contract for identifying and contacting SMEs, both for the purposes of this SME test and for the SME test related to the Noise Directive (which has run in parallel to the current study):

- Sector associations: CECE, CEMA, EGMF, EU-Nited, EUROMOT, FEM, ISMA, Pneurop, VDMA
- The European Association of Craft, Small and Medium-sized Enterprises (UEAPME)

Contacts have been made both per phone and per e-mail, in order to clearly explain the scope and the objective of the SME test. In the case of UEAPME, special attention has been paid to explaining the general context of the NRMM Directive.

We have also made clear right from the start that we wished to complement the questionnaires (see Section 3.3) with round table discussions and in-depth interviews (see Section 3.4).

3.3 Draft of a questionnaire

The IA Study had already addressed all the economic, environmental, and social issues listed in the 2006 Impact Assessment Guidelines in a detailed questionnaire. This study has not repeated this exercise. We have instead drafted a more limited list of questions that addresses how SMEs are specifically affected by each policy option. A separate questionnaire has been drafted for manufacturers (both of equipment and of engines) and for professional end users – they are attached as an annex to this report.

These questionnaires have an open format rather than the detailed closed format used for the purposes of the IA study. The questionnaires served mainly as a guidance document for further direct contacts. The scope of the questionnaire was not primarily to establish statistical information, but to serve as a tool to obtain information for representative case studies.

Possible issues could be:

- Compliance with the Directive requires investment in fixed and sunk expenditures (such as R&D or conformity assessment); these will weigh relatively more upon SMEs. This type of expenditures also includes acquiring the necessary expertise to comply with the Directive.
- SMEs can face difficulties in raising the capital necessary for compliance. This effect will be exacerbated if compliance with the Directive has no value as such for the end user.
- SMEs may have less potential for cost-pass through than large enterprises.

In order to avoid any misunderstandings concerning the target group of the questionnaire, the questionnaire contains the definition of medium-sized, small and micro enterprises as given in Commission Recommendation of 06 May 2003:

- The category of micro, small and medium-sized enterprises (SMEs) is made up of enterprises which employ fewer than 250 persons and which have an annual turnover not exceeding EUR 50 million, and/or an annual balance sheet total not exceeding EUR 43 million.
- Within the SME category, a small enterprise is defined as an enterprise which employs fewer than 50 persons and whose annual turnover and/or annual balance sheet total does not exceed EUR 10 million.

- Within the SME category, a micro-enterprise is defined as an enterprise which employs fewer than 10 persons and whose annual turnover and/or annual balance sheet total does not exceed EUR 2 million.

Whether an enterprise should be considered an SME does not only depend on its own accounts, but also on the accounts of partner or linked enterprises.

To be more concrete:

- In the case of an autonomous enterprise, the data, including the number of staff, are determined exclusively on the basis of the accounts of that enterprise.
- To the data referred to in the first subparagraph are added, the data of any *partner* enterprise of the enterprise in question situated immediately upstream or downstream from it.
- To the data referred to in the first and second subparagraph is added 100 % of the data of any enterprise, which is *linked* directly or indirectly to the enterprise in question, where the data were not already included through consolidation in the accounts.

3.4 Consultation with the identified target group

The questionnaires have been sent out after the inception meeting with the Commission services.

However, as our experience with the IA study had shown that few stakeholders have the resources to provide comprehensive answers to this type of questionnaire, the project team has proposed to concentrate on two groups of selected stakeholders:

- First, we have contacted the European industry associations that have been consulted during the IA study: AECC, CCNR, CECE, CEMA, CER, EBU, EGMF, ESO, ISMA, ORGALIME, UITP, UNIFE, VDMA and EUROMOT.
- Second, we had proposed to single out a representative group of SMEs that is willing and able to cooperate on this study. The selection of this group would take place in consultation with the European industry associations and with UEAPME. We aimed at 2 SMEs per main NRMM sector used in the IA study.

Our intention was to organise round table discussions with those selected stakeholders. Experience with the IA study had shown that this is the most effective means to elicit a maximum of information. We proposed to organise six half-day round table discussions, focussing on the most relevant sectors. Relevant sector are those where many SMEs are active as a manufacturer or as a professional user of the equipment.

We also proposed to approach the SMEs via in-depth telephone interviews and mail exchange, as it is difficult to organise meetings with them in Brussels. A round table discussion has been asked with UEAPME.

3.5 General development of the consultation process

Table 1 gives an overview of all the contacts that have been made with stakeholders.

Although the questionnaires have been sent out immediately after the signature of the contract, and although there has been a steady follow up, the general response rate has been very low.

We will discuss the specific reasons chapter per chapter, but the main reason is that, for most sectors covered by the NRMM Directive, there are very few (if any) SMEs. One of the reasons why the relative importance of the number of SMEs might have been

overestimated in the past is that the criterion of autonomy in the definition is often overlooked: companies that fulfil all other criteria (headcount and turnover or balance sheet total) can still not be considered SMEs if they are part of a larger group that does not meet the criteria. Moreover, the sector of internal combustion engines has recently gone through a consolidation phase, and the full extent of the reorganisation of the sector is now only becoming clear.

Effects on SMEs are therefore generally limited to the professional end users, who are much less familiar with the NRMM Directive.

Upstream in the product chain, the manufacturers of exhaust emissions control equipment are an important actor. The sector federation AECC does not count any SMEs amongst its members, but has referred us to some individual companies that are not members of AECC. Amongst these, one SME has been identified, which has been contacted individually. However, this contact has not led to the identification of information that could be useful for the purposes of the current study. CLEPA, the European Association of Automotive Suppliers, has informed us that this subject was of no interest to them.

Therefore, our invitation to organise round table meetings has met a very low positive response rates. We have been able to hold several telephone interviews who turned out to be very informative, but also less than we had hoped for.

As explained above, in parallel with the sector organisations, in order to reach SMEs that are not affiliated to sectoral associations, we had taken several steps in parallel:

- We have contacted UEAPME, the European Association of Craft, Small and Medium-sized Enterprises. UEAPME has sent out the questionnaires, but has pointed out that it does not work directly with SMEs, but with its members, which are national horizontal SME organisations. This means that 1) UEAPME cannot send the questionnaires directly to SMEs or invite them directly to attend meetings in Brussels 2) UEAPME does not know whether or not its members have national branch organisations specialised in the sectors concerned by the NRMM and the Noise Directives. Therefore, UEAPME cannot target these SMEs specifically. Because the NRMM and the Noise Directives are very specific, it is not possible for UEAPME to speak in the name of its members on this issue. UEAPME has also expressed concerns with respect to the representativeness of any response because of (1) the language barrier some SMEs face (2) the short deadline. This channel has not led to any specific response.
- Thanks to the kind cooperation of Mr Berck and Németh of DG ENTR, we have launched the questionnaires through the Enterprise Europe Network on 03 June. This channel has not led to any specific response.
- Taking into account that many equipment types that are covered by the Noise Directive contain engines that are covered by the NRMM Directive, we have taken a sample of more than 80 companies out of the noise database that the Commission is managing according to Article 16(4) of Directive 2000/14/EC. This sample has led to the identification of just 2 SMEs. As already pointed out above, many “small” companies do not fall under the definition of SMEs because they fail to satisfy the criterion of autonomy.
- We have also contacted associations of local authorities (Eurocities and CEMR), who are important end users of some machine types covered by the Directive. On 22 July, the CEMR has informed us that they would not be able to provide input on this issue.

On 28 May, the Commission services have sent us a list of Italian SMEs that they had received from an Italian stakeholder. All these enterprises have been contacted immediately, and some individual responses were received. On 29-30 June, reminders (per e-mail and phone) were sent to all individual companies that had not yet responded.

On 30 June, CECE has handed over a list of industry directories that could be useful in identifying individual SMEs: www.intermat.fr ; http://www.bauma.de/ ; www.smopyc.es ; www.lectura.de ; ANMOPYC ; www.khl-group.com .

These directories contain several thousands of companies. We have taken a targeted sample of 170 companies in order to identify SMEs that are not members of the sector associations. Based upon publicly available information, we have concluded that 71 of these companies do not fall within the EC definition of SMEs. All other companies have been contacted individually.

PNEUROP has informed us that, to the best of their knowledge, none of their members is actually an SME. However, they have provided us with a (short) list of manufacturers that they think may be SMEs but that are not members of PNEUROP. These manufacturers have been contacted individually.

On 15 September, CECE has also handed over a list of companies that produce drill rigs. They have all been contacted individually.

In some cases, individual respondents to the questionnaires have also indicated that some of their competitors may well fall within the EC definition of SMEs. These companies have been contacted individually. Reminders have been sent.

On 12 October 2009, the contract was formally amended, allowing an extension until the end of March 2010.

We have used this extension to send reminders, both to professional organisations and to the companies that had been contacted on an individual basis. This has unfortunately not led to a significant increase in the response rate.

Table 1: List of contacts with stakeholders[3]

Professional association	Sector	First contact	Submission of questionnaire	Follow up contact 1	Follow up contact 2	Follow up contact 3	Follow up contact4	Follow up contact5	Live meeting
AECC	Engine exhaust emissions control.	17 June	25 August						08 July
CECE	Construction equipment	05 May	08 May	03 June	18 June	08 October	12 November	04 January 2010	30 June
CEMA	Agricultural machinery	06 May	08 May	03 June	04 July	08 October	04 January 2010		
CEMR	Local authorities	12 May	04 July						
CEVI	Wine growers	12 May	26 June	10 August					Several phone interviews
CLEPA	European Association of Automotive Suppliers	12 August	25 August	27 October					
COPA-COGECA	Farmers	12 May	26 May	26 June	08 October	27 October	20 November		14 July

[3] As the questionnaires related to the SME test for the Noise Directive have been sent out simultaneously, not all the industry federations listed here are relevant for the NRMM Directive.

Dr Hartmut Mayer	Snow groomers	08 May	26 June						Phone interviews in first week of August
EBU	European Barge Union	06 May	08 May	26 May					(phone)
EGMF	Garden equipment	05 May	08 October						01 July; 16 November
ELCA	Landscape contractors	11 May	08 June	24 June	04 July	08 October	27 October	23 November	
ENFE	Forest entrepreneurs	14 July	07 August	01 September	21 October				
ERFA	Rail Freight Operators	27 May	Submitted by UNIFE	17 June	04 July	06 July	08 October		
Eurocities	Local authorities	12 May	04 July						Phone interview on 24 November
EUROMOT	Internal combustion engines	05 May	08 May	03 June	17 June				
FEM	Lifting equipment	08 May	27 October	20 November					

FIEC	Construction industry	18 June	26 June	04 July	04 August	09 August	08 October		
Holland Shipbuilding Association	Dutch shipbuilders	08 July	04 August	02 September	21 October	04 December			
ISMA	Snowmobiles	05 May	08 May	26 May	03 June				15 May
RFG	Rail freight group (UK)	16 June (following submission of policy position)	23 June (mail to individual members)						
UEAPME	Small and medium enterprises	06 May	15 June	24 June	08 October				
UNIFE	Railway industries	07 May	08 May	26 May					
Vereniging Importeurs Verbrandingsmotoren	Engine dealers	08 July	02 September	05 January 2010					03 December

3.6 Analysis of the results of the consultation

The project team has used the results of the consultation to determine the specific impacts on SMEs.

In our proposal, we had indicated that we expected that most information would be of a qualitative nature because:

- Notwithstanding the possibility to sign confidentiality agreements with the consultants, firms are often reluctant to discuss quantitative issues.
- Firms often do not yet fully understand themselves the compliance costs linked to stricter noise emission limits
- The accounting systems dot not provide systematic information on some of the most crucial issues (such as administrative compliance costs)

These expectations have been confirmed.

Instead of focussing on a quantitative or statistical exercise extrapolating quantitative data over the population, we had proposed to undertake case studies focussing on the problems SMEs encounter and possible mitigating measures. As it turned out that the response to the questionnaires has been very poor, we have indeed been able to invest significant time in in-depth discussions with individual respondents. Actually, the main bottleneck for these case studies turned out to be the limited resources that individual companies could make available to respond to our requests for further clarification.

In general, the information we have received was too sketchy and incomplete to conduct a comprehensive cost-benefit analysis.

Instead, we have used the following pragmatic approach to summarize the impacts:

- Wherever additional information has been identified on the costs of complying with the Directive, we have verified how this affects the outcome of the cost-benefit analysis of the IA study.
- Compliance costs do not tell the whole story. For instance, they do not consider the consequences of bankruptcies and they do not consider the possibility that firms may merge – in both cases, jobs may be lost in the short run. Although we think that the origins of persistent unemployment must be understood in terms of the functioning of the labour market, we have to acknowledge that lay-offs can lead to significant welfare losses for those affected, particularly in relatively isolated regions with high structural unemployment. Therefore, we have again taken a worst-case perspective by looking at the maximum number of jobs at stake, and by verifying the average[4] unemployment of the region[5] where the affected firms are based.

A specific issue that has to be kept in mind throughout this report is the impact of the economic recession, of which the full impact was not yet clear at the time of the IA study.

The specific impact on SMEs is ambiguous, as reported recently in *The Economist*[6]:

- In Germany, sales by SMEs are expected to contract by 2% this year, while the economy as a whole is expected to shrink by 6%. *The Economist* attributes this in part to the fact that German domestic consumption is holding up, and that SMEs

[4] Taken over the last 10 year (source: Eurostat).
[5] At the NUTS3 level.
[6] The Economist. Small businesses in Europe. Humble but nimble. May 21st 2009

serving the home market are doing relatively well. The situation is different for export-oriented firms, such as machine-tool manufacturers, where sales are expected to drop significantly.

- In a recent survey of SMEs in France, just over half of them expected revenues to either stay flat or increase in 2009.
- SMEs (even with high credit ratings) face an unprecedented shortage of bank credit.
- The greater flexibility of SMEs and their closeness to their customers make them better at managing downturns.
- In Britain, the number of corporate liquidations increased by 56% compared with the same period a year earlier. Most victims were SMEs. However, a recent survey reported that 60% of small businesses were performing as well as or better than last year.
- In France the corporate bankruptcy rate jumped by 21% for the first quarter of 2009, but 70% of the failures were at the very tiniest firms with no employees other than their founders.

Therefore, we cannot draw any general a priori conclusions with respect to the impact of the current economic downturn on the subject of our analysis. This impact will have to be verified on a case by case basis.

3.7 Identification of possible alternative options and mitigating measures

The objective of this activity is to identify measures to avoid a disproportionate burden falling upon SMEs.

Examples of possible measures could be[7]:

- Exemptions from (some aspects of) the Directive, but respecting the emission limits laid down in the Directive.
- Longer transition periods
- Direct or indirect financial support (insofar as this is compatible with competition and trade law)
- Information provision by public authorities

.

Considering a general simplification of the Directive falls outside the scope of this study. We have also evaluated the merits of other mitigating measures that have been suggested during the consultation process – these will be discussed on a case by case basis for each individual equipment type.

For each equipment grouping and for each scenario, the pros and the cons of each measure have been discussed.

3.8 Eurostat data on SMEs

According to Eurostat, SMEs represented 99.8 % of all EU-27 enterprises in the non-financial business economy in 2006, employing two thirds of the workforce (67.4 %) and

[7] For more details, see http://ec.europa.eu/enterprise/entrepreneurship/docs/tsf_study_toolkit.pdf

generating 57.7 % of total value added. However, these figures vary widely from sector to sector.

The latest survey of the Observatory of European SMEs was carried out end of 2006 and early 2007 in the 27 Member States of the European Union (EU), as well as in Norway, Iceland and Turkey, the countries participating in the Multiannual Programme for Enterprise & Entrepreneurship. It included large-scaled enterprises (employing at least 250 persons) in its sample, to allow an identification of the specific performances, behaviour and problems of SMEs. Unfortunately, the level of sectorial disaggregation[8] was too high to be useful for the current study.

We have consulted the Structural business statistics of Eurostat[9]. At the 1 digit level, we found the following estimates for the sector "manufacturing" for 2006 (EU27):

Table 2: Structural Business Statistics for the manufacturing sector

	Total	Employment between 1 and 19	Employment between 20 and 49	Employment between 50 and 249
Number of enterprises	2 309 5520		130 778	83 548
Number of persons employed	34 412 800		4 088 200	8 639 100

Based upon this information, one would expect that the current study would have identified a high number of SMEs. However, the Eurostat figures can be misleading if one does not look carefully at the definitions used by Eurostat. Actually, *Annual* structural business statistics with a breakdown by size-class are the main source of data for an analysis of SMEs by Eurostat. A limited set of the standard SBS variables (number of enterprises, turnover, persons employed, value added, etc.) is available mostly down to the 3-digit (group) level of the NACE Rev. 1.1 classification, based on criteria that relate *to the number of persons employed* in each enterprise. Thus, the Eurostat breakdown of size classes only takes into account employment levels – it does not use the criteria related to turnover or balance sheet total. The criteria concerning partner and linked enterprises are not taken into account either[10].

Purely for illustrative purposes, we have identified the sectors (up to the three digit NACE level) that manufacture non-road mobile machinery – this is listed in Table 3. For some equipment types, it is not clear where they should be classified at the 3 digit level. From the description of each sector, it is clear that the level of aggregation at the three digit level is still too high for the purposes of this study. Each sector can be expected to include companies that are not involved at all in the production of machinery in which engines are installed that are subject to the NRMM Directive. Moreover, even for those companies that are indeed affected by the Directive, the Eurostat figures give no indication of the share of their turnover that is covered by the Directive.

[8] Manufacturing; construction; wholesale and retail; hotels and restaurants; transport, storage and communication; financial intermediation; real estate, renting and business activities; health and social work; other community, social and personal service.

[9] http://epp.eurostat.ec.europa.eu/portal/page/portal/european_business/data/database

[10] Communication from the Eurostat User Support.

Therefore, any Eurostat figures on the number of SMEs have to be used with a lot of care – they should be considered as an upper bound to the number of SMEs according to the EC definition. Unfortunately, there are no additional data available that would allow us to estimate how large the discrepancy is between the definition used by Eurostat and the definition we use in the current study. As the Commission services have clearly stated that the definition of SMEs should not be loosened for the purposes of this study, we have not used the Eurostat data and have limited ourselves to the response received from the industry federations and individual companies instead.

Table 3: NACE codes of manufacturing sectors affected by the Noise Directive

NACE code	Description	Includes	Excludes
29.12	Manufacture of pumps and compressors	manufacture of air or vacuum pumps, air or other gas compressors manufacture of pumps for liquids whether or not fitted with a measuring device manufacture of fluid power equipment and pneumatic and wind power engines and motors	manufacture of hydraulic transmission equipment, see 29.14
29.22	Manufacture of lifting and handling equipment;	manufacture of hand-operated or power-driven **lifting, handling, loading or unloading machinery**: pulley tackle and hoists, winches, capstans and jacks derricks, cranes, mobile lifting frames, straddle carriers, etc. works trucks, whether or not fitted with lifting or handling equipment, whether or not self-propelled, of the type used in factories mechanical manipulators and industrial robots specifically designed for lifting, handling, loading or unloading manufacture of conveyors, teleferics, etc. manufacture of lifts, escalators and moving walkways maintenance of lifts and escalators	manufacture of continuous-action elevators and conveyors for underground use, see 29.52 manufacture of mechanical shovels, excavators and shovel loaders, see 29.52 manufacture of industrial robots for multiple uses, see 29.56 manufacture of floating cranes, railway cranes, crane-lorries, see 34.10, 35.11, 35.20 installation of lifts and elevators, see 45.31
29.32	Manufacture of other agricultural and forestry machinery	manufacture of mowers, including lawnmowers manufacture of agricultural self-loading or self-unloading trailers or semi-trailers manufacture of agricultural machinery for soil	manufacture of agricultural hand tools, see 28.62 manufacture of works trucks, see 29.22

		preparation, planting or fertilizing: ploughs, manure spreaders, seeders, harrows, etc. – manufacture of harvesting or threshing machinery: harvesters, threshers, sorters, etc. manufacture of milking machines manufacture of spraying machinery for agricultural use manufacture of diverse agricultural machinery: poultry-keeping machinery, bee-keeping machinery, equipment for preparing fodder, etc. machines for cleaning, sorting or grading eggs, fruit, seed, grain, etc.	manufacture of cream separators, see 29.53 manufacture of road trailers or semi-trailers, see 34.20
29.41	Manufacture of portable hand held power tools	manufacture of pneumatic or motorized hand tools manufacture of parts of chain saws; parts of pneumatic tools; parts of hand tools, with a non-electric motor manufacture of parts of tools for working in the hand, with electric motor	
29.52	Manufacture of machinery for mining, quarrying and construction	manufacture of continuous-action elevators and conveyors for underground use manufacture of boring, cutting, sinking and tunnelling machinery manufacture of machinery for treating minerals by screening, sorting, separating, etc. manufacture of **concrete *and* mortar mixers** manufacture of earth-moving machinery: o **bulldozers**, angle-dozers, **graders**, scrapers, levellers, mechanical	manufacture of lifting and handling equipment, see 29.22 manufacture of wheeled tractors, see 29.31, 34.10 manufacture of machine tools for working stone, including machines for splitting or clearing stone, see 29.4 manufacture of concrete-mixer lorries, see 34.10

		shovels, shovel loaders, etc. manufacture of pile-drivers and pile-extractors, mortar spreaders, bitumen spreaders, concrete surfacing machinery, etc. manufacture of bulldozer and angle-dozer blades	
31.10	Manufacture of electric motors, generators and transformers	manufacture of AC motors manufacture of AC generators manufacture of universal AC/DC motors manufacture of DC motors or generators manufacture of AC or DC generator sets manufacture of electric rotary or static converters manufacture of electrical transformers	manufacture of vehicle generators and cranking motors, see 31.61 manufacture of diode valves, see 32.10
34.10	Manufacture of motor vehicles	manufacture of passenger cars manufacture of commercial vehicles: vans, lorries, over-the-road tractors for semi-trailers, **dumpers for off-road use**, etc. manufacture of buses, trolley-buses and coaches manufacture of motor vehicle engines manufacture of chassis fitted with engines manufacture of other motor vehicles: **snowmobiles**, golf carts, amphibious vehicles fire engines, **street sweepers**, travelling libraries and banks, etc. manufacture of motor cycle engines	manufacture of agricultural and industrial tractors, see 29.31, 29.52 manufacture of electrical parts for motor vehicles, see 31.61 manufacture of bodies for motor vehicles, see 34.20 manufacture of parts and accessories for motor vehicles, see 34.30 maintenance, repair and alteration of motor vehicles, see 50.20"

4 Small spark ignited engines

The scope of the IA study was limited to a possible extension of the exemption for the stage II emission limits for the following product categories:

- Top handle machines (hand-held drills, tree service chainsaws)
- Hand held hedge trimmers

The IA study had reported that the market for engines was heavily concentrated with a relatively small share for SMEs. The in-depth market analysis undertaken for the current project has revealed that the estimates provided by the stakeholders had overlooked the autonomy criterion in the definition of SMEs. Many companies that are “apparently” SMEs are actually part of larger groups, even though they may still operate under their own brand name. Based upon our consultation with the sector federation, we have to conclude now that none of the engine manufacturers actually falls within the definition of SMEs. This implies that the scope of this chapter is limited to the impact on end users and on the manufacturers of machinery.

4.1 Impact on end users

The professional end user market is mostly composed of small business: professional gardeners and landscape workers, farmers, forestry workers and services of small municipalities.

4.1.1 Professional gardeners and landscape workers

The effects on professional gardeners and landscape workers have already been discussed in the IA study, but we have still contacted the European Landscape Contractors Association on 11 May in order to obtain further details. ELCA has sent a response on 15 June. The initial information provided by ELCA was not sufficiently concrete for the purposes of our study. Therefore, ARCADIS had proposed to provide with more than 100 additional guidance for the questionnaire, and to hold a telephone interview instead. ELCA has submitted a new answer on 11 September. The answer remained vague, but our repeated invitations for additional information (see Table 1) have not led to more specific information.

The landscape gardening industry in Europe is composed of 74,000 companies with approximately 350,000 employees. It is dominated by small enterprises. In more than 50% of European companies, there are 10 or less employees. It is only in The Netherlands and the UK that the number of companies employees exceeds 5% of the total. Except in Finland and in Poland, private customers generate the largest turnover – the importance of public customers is declining[11].

The IA study had pointed out that gardening sector is highly labour intensive. One would therefore expect that an increase in the cost of equipment would have a relatively less important impact than in other, more capital intensive, sectors.

ELCA has confirmed that the equipment costs form indeed only a small part of their entire cost structure. However, the share of machine costs within the total cost structure varies from 8% in Germany and The Netherlands to 28% in Poland. ELCA claim that the current

[11] ELCA, Structural Survey 2008.

labour costs have already reached the limits of the customers' willingness to pay, but has provided no concrete information that could substantiate this claim.

We can conclude that the consultation with ELCA has not lead to the identification of any new information that modifies the conclusion of the initial IA study.

4.1.2 Farmers and forestry workers

For the impact on end users in the agricultural sector, we have contacted COPA-COCEGA. A meeting to discuss the approach for the consultation has taken place on 14 July. As no response had been received from COPA-COGECA by the end of September, ARCADIS has submitted a thoroughly simplified questionnaire to COPA-COGECA with a renewed request to forward this questionnaire to the members. No answer has been provided.

For the impact on end users in the forestry sector, we have contacted the European Network of Forest Entrepreneurs (ENFE). A simplified version of the questionnaires has been submitted to their national member associations. After the extension of the contract was signed, we have sent a general reminder to all member associations. No response has been received.

Therefore, it is not possible to give even an indicative estimate of the possible impact of changes to the Directive on professional users in the agricultural and forestry sector.

4.1.3 Small municipalities

We have discussed the analysis in chapter 3.1 of the impact assessment study with a representative of EUROCITIES, and he does not see specific reasons to question the figures put forward by the industry. If these figures are an accurate representation of the impacts, this representative would be in favour of granting further exemption of Stage II of the Directive for top handle tree service chainsaws and hand held hedge trimmers.

4.2 Impact on equipment producers

On 16 November 2009, EGMF has organised a round table meeting between ARCADIS and equipment producers. Besides sector representatives (EGMF, Euromot), the meeting was attended by 2 SMEs. A third "small" company participating in the meeting is member of a larger group and is thus not as SME according to the EC definition – however, its participations to the discussion has added interesting perspectives. 2 Italian SMEs have also been approached by Euromot, but were not interested in participation.

One of the SMEs that participated in the meeting does not produce tree service chain saws and hand held hedge trimmers, and is thus not affected by the options for revision of the Directive that are under discussion. As one of the conceivable mitigating measures for SMEs could consist in adaptations to the small volume derogations of the Directive (see below), the participation of this company has still added value to the debate.

In what follows:

- Com.A refers to the SME that produces both tree service chain saws and hand held hedge trimmers.
- Com.B refers to the SME that does not produce tree service chain saws and hand held hedge trimmers.
- Comm.C refers to the "small" company that produces both tree service chain saws and hand held hedge trimmers, but is part of a larger group (and therefore does not fulfil the EC criteria for being an SME).

4.2.1 General issues with the NRMM Directive

The producers participating in the round table meeting reckoned that the stages for the NRMM Directive are short, and that is not always possible to recover the costs for R&D. They find this especially problematic for niche markets, where products are developed for special applications. One of the participants estimates that the payback for R&D is 5 to 10 years, while the current product lifetime is 15 to 20 years. Currently, most R&D is driven by the need to comply with regulations (the NRMM Directive, but also safety issues and the Noise Directive).

The limited resources for R&D within SMEs imply that R&D is becoming a bottle-neck and that no resources remain for customer-oriented R&D. Due to this, Com.B claims that it has dropped one engine type from its product range.

For some product types, the producers affirm that that there exist trade-offs between compliance with the NRMM Directive and compliance with the Noise Directive. For instance, compliance with the Noise Directive often necessitates a reduction in engine speed that makes it more difficult to comply with the NRMM Directive.

With phase 2 of the NRMM Directive, several integrated producers quit the manufacturing of engines, and buy engines off the shelf instead. However, this possibility does not necessarily exist for all equipment types. Comm.B for instance claims that for lawnmower on steep slopes, 2 stroke engines are needed. These are niche products but they have to fulfil the same requirements as 4 stroke engines that are produced in millions. In this case, the engine is an integrated part of the machine, and it is not possible to buy engines on the market.

4.2.2 The markets under scrutiny

The market for tree service chain saws is a stable market. Demand originates from mainly professional users who usually stay with their suppliers.

The situation for hand held hedge trimmers is slightly different: this market is shrinking because battery products are becoming more and more important. At the moment, battery powered hedge trimmers are already sold in the hobby market. However, one of the participants in the round table reckoned that in 3 to 5 years time, the battery driven products could also be used by the professional users[12]. Currently, the main problem with this technology is its weight (7 kg). A battery powered hedge trimmers would cost around 1 000 EUR (battery included), compared to 450 EUR for a petrol driven hedge trimmer. Also, a petrol driven hedge trimmer has a power of 700 W (compared to 300 W for a battery powered one). For chain saws, a minimum power of 1 kW is needed, and batteries are not a realistic option.

This implies that, whilst the provisions for hand held hedge trimmers could become redundant by the end of the next decade (due to the development of battery products), no such development are expected for chains saws.

4.2.3 The options under revision

Some large manufacturers are close to finding technical solutions for stage II for tree service chain saws and hedge trimmers. As these solutions will be protected by patents and as there are only a small number of possible solutions, it will be very difficult for other manufactures (certainly SMEs) to get around these specific solutions. The alternative would be to get a license from the manufacturers who have developed a solution. This

[12] Battery driven hedge trimmers could then be recognized as "zero emission technology" which under Californian regulation would lead to credits to offset the emissions from other equipment.

would cost approximately 20 EUR per engines - this figure gives a lower bound to the cost of complying with stage II. Compared to a sales price of approximately 200 EUR, this would put SMEs at a significant disadvantage. It should be noted that the IA related to the Noise Directive had already revealed that, due to intellectual property rights, it was unlikely that innovative solutions to emission reductions would quickly spread throughout the sector.

Com.A has confirmed that, if the stage II emission limits would come into force, they will exit the market for tree service chain saws. It is not sure whether they will exit the market for hand held hedge trimmers. If they would discontinue production of tree service chain saws and hand held hedge trimmers, the *direct* impacts on employment would be very limited (2 or 3 people in production), as the sales in these product categories are very low anyway. In addition, a discontinuation of production of some product lines would also have a major impact on the dealer network: dealers are not always interested in partial lines. If, following this disruption of supply, dealers would switch to other companies for the full product range, about one third of the jobs in Com.A would be in jeopardy.

Com.C would exit both markets. They do not think it will be possible to re-enter the market after exit, even if they would find a technical solution to comply with stage II in the meanwhile. About half of the employment in the company (100 people) is involved directly in the production of chain saws (but this also includes other chain saws than tree service chain saws).

Com.A and Com.C emphasize that they have some "traditional" customers with whom they have established a long term relationship. An exit from the market would lead to a breakdown of this relationship.

For SMEs the unregulated markets outside the EU are not large enough to compensate for the potential loss of the EU market. The US market is also regulated but the Averaging, Banking and Trading (ABT) provisions provide a flexibility that the NRMM Directive does not provide – see below. Comm.B has signalled that, for an SME, it is very difficult to export outside the EU. An important barrier to export is compliance with regulations, which may differ from EU regulations.

4.2.4 The small volumes derogation

4.2.4.1 The situation in the US

In the US, there exist provisions for small volume families, but also an averaging, banking and trading system (ABT). Manufacturers who develop a niche product to do not have to incur the R&D costs linked to the emission limits if they have offsets.

We describe both systems in turn[13].

In US legislation, **small volume engine family** means any handheld engine family or any nonhandheld engine family whose eligible production in a given model year are projected at the time of certification to be no more than 5,000 engines.

Small volume engine manufacturer means, *for nonhandheld engines*, any engine manufacturer whose total eligible production of nonhandheld engines are projected at the time of certification of a given model year to be no more than 10,000 nonhandheld engines. For *handheld engines*, the term small volume engine manufacturer means any engine manufacturer whose total eligible production of handheld engines are projected at

[13] Information on this issue has been provided by Mr John Foster (STIHL US).

the time of certification of a given model year to be no more than 25,000 handheld engines.

Small volume equipment manufacturer means, for *nonhandheld equipment*, any equipment manufacturer whose production of nonhandheld equipment subject to regulation under 40 CFR Part 90 or powered by engines regulated 40 CFR Part 90, does not exceed 5,000 pieces for a given model year or annual production period[14]. For *handheld equipment*, the term small volume equipment manufacturer has the same meaning except that it is limited to 25,000 pieces of handheld equipment rather than 5,000 pieces of nonhandheld equipment.

Small volume equipment model means, *for nonhandheld equipment*, any unique model of equipment whose production subject to regulations 40 CFR Part 90 or powered by engines regulated under 40 CFR Part 90, does not exceed 500 pieces for a given model year or annual production period[15]. For handheld equipment, the term small volume equipment model has the same meaning except that it is limited to 5,000 pieces of handheld equipment, rather than 500 pieces of nonhandheld equipment.

From "§ 90.103 Exhaust emission standards", the EPA makes the following allowances:

> (6) In lieu of certifying to the applicable Phase 2 standards, small volume engine manufacturers as defined in 40 CFR Part 90 may, at their option, certify their engine families as Phase 1 engines until the 2010 model year for nonhandheld engine families excluding Class I-A and Class I-B engine families, until the 2008 model year for Class III and Class IV engine families, and until the 2010 model year for Class V engine families. Such engines shall not exceed the applicable Phase 1 standards and *are excluded from the averaging, banking and trading program*[16] and any related credit calculations. Beginning with the 2010 model year for nonhandheld engine families, the 2008 model year for Class III and Class IV engine families, and the 2010 model year for Class V engine families, these engines must meet the applicable Phase 2 standards.
>
> (7) In lieu of certifying to the applicable Phase 2 standards, manufacturers of small volume engine families, as defined 40 CFR Part 90 may, at their option, certify their small volume engine families as Phase 1 engines until the 2010 model year for nonhandheld engine families excluding Class I-A and Class I-B engine families, until the 2008 model year for Class III and Class IV engine families, and until the 2010 model year for Class V engine families. Such engines shall not exceed the applicable Phase 1 standards and *are excluded from the averaging, banking and trading program*[17] and any related credit calculations. Beginning with the 2010 model year for nonhandheld engine families, the 2008 model year for Class III and Class IV engine families, and the 2010 model year for Class V engine families, these engines must meet the applicable Phase 2 standards.

[14] Excluding that equipment intended for introduction into commerce for use in a state that has established its own emission requirements applicable to such equipment or engines in such equipment, pursuant to a waiver granted by EPA under section 209(e) of the Clean Air Act.
[15] Again, excluding that equipment intended for introduction into commerce for use in a state that has established its own emission requirements applicable to such equipment or engines in such equipment, pursuant to a waiver granted by EPA under section 209(e) of the Clean Air Act.
[16] Emphasis added.
[17] Emphasis added.

According to "§ 90.104 Compliance with emission standards", the EPA allows small volume engine manufacturers and small volume engine families to *use an assigned deterioration factor* in lieu of conducting full engine durability testing.

The EPA also *allows* small volume manufacturers and small volume engine families *to opt out of conducting production line testing.*

The **ABT system** is applicable to Phase 2 SI engines.

Central in the ABT system is the concept of emission credits, which represent the amount of emission reduction or exceedance, by an engine family, below or above the applicable $HC+NO_x$ ($NMHC+NO_x$) emission standard, respectively. Emission credits per engine family are calculated according to the following equation:

Credits = Production * (Standard – FEL) * Power * Useful Life * Load Factor

Where[18]:

- Production is the eligible production.
- Standard is the current and applicable small SI engine $HC+NO_x$ ($NMHC+NO_x$) emission standard in grams per kilowatt hour.
- FEL is the family emission limit for the engine family in grams per kilowatt hour.
- Power is the maximum modal power of the certification test engine, in kilowatts.
- Useful life is the useful life in hours corresponding to the useful life category for which the engine family was certified.
- Load factor depends on the test procedure.

The ABT system allows for:

- Averaging, which means the exchange of emission credits between engine families within a given manufacturer's product line;
- Banking, which means the retention of emission credits by the manufacturer generating the emission credits or obtaining such credits through trading, for use in future model year averaging or trading.
- Trading, which means the exchange of emission credits between manufacturers.

4.2.4.2 Description of the scheme

The NRMM Directive contains some clauses that aim at accommodating the specific needs of SMEs.

The flexibility scheme of the Directive (see Chapter 7) was only introduced for diesel engines. An essential difference with the American system is that the ABT scheme takes the power of the engine into account, and thus is more representative of real world emissions than the flexibility scheme. With SI engines, there is a much wider range of real world emissions within one power band than in the case of CI engines - this explains why the flexibility scheme was applied to CI engines, and not to SI engines.

For SI engines, the Directive has introduced the "small volume" scheme instead.

Article 2 of the NRMM Directive gives the following definitions:

- small volume engine family shall mean a spark-ignition (SI) engine family with a total yearly production of fewer than 5 000 units

[18] Abstracting from technical and procedural details.

- small volume engine manufacturer of SI engines shall mean a manufacturer with a total yearly production of fewer than 25 000 units.

According to Article 10 of the Directive:

- The requirements of Article 9a(4) and (5)[19] shall be postponed by three years for small volume engine manufacturers.
- The requirements of Article 9a(4) and (5) shall be replaced by the corresponding stage I requirements for a small volume engine family to a maximum of 25 000 units providing that the various engine families involved all have different cylinder displacements.

Moreover, according to Appendix 4 to Annex IV, small volume engine manufacturers may, optionally, take deterioration factors for HC + NO_x and CO from table 1 or 2 in section 1.3 or they may calculate deterioration factors for HC + NO_x and CO according to the process described in section 1.3.1.

This system is thus very similar to the small volume provisions applicable in the US. The main difference is that European legislation does not allow for ABT.

4.2.4.3 Viewpoints of the industry

These provisions imply that there is a threshold of market volume (i.e. 25 000 units) beyond which SMEs cannot grow without losing the benefits of the small volume exemptions. Therefore, these provisions act as a disincentive to growth for small companies.

For tree service chain saws and hand held hedge trimmers, an additional problem is that they are defined by standards (ISO 11681-2 and EN 774, respectively, according to Article 9a of the NRMM Directive). If a company develops a product that does not comply with the standard, this product falls outside the scope of the derogation. This is particularly problematic for SMEs who tend to focus on niche applications instead of producing for the mass market (where they have a cost disadvantage compared to larger companies). SMEs cannot certify equipment to the standard if they make customized products.

Therefore, the participants to the Round Table meeting pointed out that it would help SMEs if more flexibility was introduced in the "small volume" scheme.

One possible way to introduce more flexibility would be to abolish the upper bound of 5 000 units for each family, as long as the total production of the firm stays within 25 000 units. In the view of the industry, this would be especially valuable for niche products (this advantage also applies to large companies when they are developing new products). Some flexibility could also be introduced in the 25 000 limit (for instance, using a 5 year average instead of a yearly figure).

Increased flexibility would bring the following advantages:

- SME could better cope with difference in the market demand for individual product lines. In some cases, potential demand for an individual family may be larger than 5 000 units, in other cases it may be smaller.
- This would allow SMEs to take advantage of the fact that some of their engines are already below the limits.
- One participant in the meeting has pointed out that the NRMM Directive leads to important risks for innovating companies. If a company has an idea for a new product,

[19] The limit dates for type approval and placing on the market of spark ignition engines under Stage II of the Directive.

compliance with legislation has to be assured even before the company can test the product with the client. This constitutes a barrier to innovation. More flexibility in the small volume exemptions could help overcome this problem.

The two most important drawbacks of more flexibility are:

- The uncertain environmental impact
- The added administrative complexity and the potential for loopholes

Let us consider both issues in turn.

4.2.4.4 Environmental impacts

First, when considering the impacts of **using 5 year averages rather than annual figures**, we can limit our attention to markets where sales increase through time. The main effect of using a 5 year average would be that some manufacturers would enjoy the "small volume engine manufacturer" exemption longer than under an annual figure. Thus, this would always lead to increased emissions compared to the current system. The exact magnitude of the impact would depend on the volatility of the business cycle and on the individual characteristics of each equipment type. Taken into account that the contribution of small SI engines to total NRMM NOx emissions is very small[20], the environmental effect of such an increased flexibility is likely to be small.

It is interesting to compare this with the American ABT system. Banking also allows the manufacturers to take advantage of the temporal variation of the demand for their products, but the total environmental impact through time is given: each increase in emissions in a given time period has to be compensated by a decrease in another time period. A possible disadvantage of the banking system is that its monitoring is more complex, and thus that it entails higher transaction costs.

Second, let us consider **abolishing the 5 000 units threshold while maintaining the 25 000 units threshold** at the company level.

To understand the effects of such a measure, consider a hypothetical company that produces two 2 types of equipment:

- The current market demand for Equipment A is 10 000 units. The manufacturer has no technical solution to comply with stage II. His current unit profits are 10 EUR.
- The current market demand for Equipment B is 20 000 units. The manufacturer can develop a technical solution to comply with stage II three years after the entry into force of the stage II. Once this solution has been developed, it is still cost-effective for the manufacturer to produce 20 000 units of this equipment under stage II. His current unit profits are 5 EUR; under stage II, they are 3 EUR.

Under the current scheme, the manufacturer enjoys the "small volume engine manufacturers" derogation for 3 years if he reduces his total production to 25 000 units. As he will not be able to put compliant equipment on the market in the first three years after the introduction of stage II, the manufacturer optimally reduces the production of equipment B with 5 000 units in the first three year (because the profit margins on equipment B are smaller than on equipment A). This will allow him to enjoy the "small volume engine manufacturers" derogation, but this will come at the cost of 25 000 EUR of foregone profits compared to stage I. After three years, in order to enjoy the "small volume engine family" derogation for Equipment A, the manufacturer will have to reduce

[20] JRC, 2007 Technical review of the NRMM Directive 1997/68/EC as amended by Directives 2002/88/EC and 2004/26/EC, p 2.

his production of Equipment A to 5 000 units, and he will lose 50 000 EUR of profits annually on Equipment A. However, he can now expand his production of Equipment B, which is now stage II compliant. Under stage II, his per unit profits for Equipment B are 3 EUR. Therefore, if the manufacturer expands his production of Equipment B from 15000 to 20 000 units, his profits on Equipment B increase with 15 000 EUR.

Suppose now instead that the "5000 units" threshold for each individual engine family is abolished but that the "25 000 units" threshold to qualify as a "small volume engine manufacturer" is maintained. Clearly, after three years, it is then optimal for the manufacturer to continue producing 10 000 stage I complying units of Equipment A, and 15 000 units of Equipment B. Compared to the current "small volume" scheme, his profits on Equipment A increase by 50 000 EUR, and his profit on Equipment B decrease by 15 000 EUR. There is a net gain of 35 000 EUR compared to the current scheme.

What is now the environmental impact?

Suppose first that:

- In its typical usage, Equipment A emits 1 kg of HC + NOx per year when complying with stage I.
- In its typical usage, Equipment B emits 8 kg of HC + NOx per year when complying with stage I, and 2 kg when complying with stage II.

Total emissions under the "small volume engine family" derogation are then:

	Emissions under current scheme	Emissions under alternative scheme
Equipment A	5000	10000
Equipment B	40000	30000
Total	45000	40000

Under these assumptions, there is clearly a "win-win" situation when the derogation system is made more flexible: profits increase, and polluting emissions decrease as well.

It is however easy to see that this needs not to be so. Suppose alternatively that the typical annual emissions of Equipment A are 4 kg of HC + NOx. This yields the following result:

	Emissions under current scheme	Emissions under alternative scheme
Equipment A	20000	40000
Equipment B	40000	30000
Total	60000	70000

In this case, introducing flexibility in the derogation system leads to an increase in polluting emissions.

We can summarize our findings as follows: abolishing the upper bound per family leads to higher profits for the manufacturers, but its impact on the environment is ambiguous. The net benefits depend on the individual environmental characteristics of the equipment under consideration. One possible way to cope with this problem would be to take into account the environmental performance of each individual engine family when deciding on the possible application of the derogation, but then one would effectively move into the direction of the American ABT system. Indeed, the averaging and banking provisions also allow manufacturers to shift the burden of emission reduction to the equipment types where this can be done at the lowest cost. However, because the system is defined in terms of total emissions, the global environmental effect is determined in advance. This is not the case with the small volume provisions, where the environmental impact is uncertain. However, as already pointed out above, the contribution of small SI engines to total NRMM NOx emissions is very small[21], and the environmental effect of such an increased flexibility is likely to be small. It could be argued that this small environmental cost is too small compared to the arguably higher monitoring costs of the ABT system.

4.2.4.5 The potential for loopholes

Another central question is how to create flexibility in the “small volume” scheme without loopholes. According to Euromot, there are serious problems with the enforcement of small volume exemptions. Currently, some non EU companies set up fictitious companies that import their equipment under the "small volume derogations" into different European countries. Due to a lack of coordination and communication between the custom authorities, this fraud is not easily detected.

Euromot therefore calls for the establishment of a transparent database and a labelling scheme for small volume articles. This database should include all the information that is needed for independent testing of the products of competitors.

In the current system, a manufacturer who suspects competitors to abuse the system has to direct the complaint to his national authorities. However, the manufacturer cannot communicate directly with the authorities in the other member states.

Euromot claims that in the current situation, the national authorities do not check compliance (even though in most countries, violation of the NRMM Directive is a criminal act). The only way for a company to enforce the law is therefore to sue other companies for unfair competition. Therefore, Euromot would like to have a self-policing system.

The paradox of the small volume derogation is that large companies can afford the means for monitoring the market, while SMEs (for which the small volume derogation has been designed) do not have the resources to do so.

4.3 Conclusion

The scope of the IA study was limited to a possible extension of the exemption for the stage II emission limits for the following product categories:

- Top handle machines (hand-held drills, tree service chainsaws)
- Hand held hedge trimmers

Regarding the options under scrutiny in the IA study, we can summarize the main findings of this chapter as follows:

[21] JRC, 2007 Technical review of the NRMM Directive 1997/68/EC as amended by Directives 2002/88/EC and 2004/26/EC, p 2.

- There are **no SMEs** involved **in the manufacture of engines** for these equipment types.
- The professional end user market is mostly composed of small business. However, the response rate from the affected sectors was extremely low and we have identified no information that would lead us to revise the conclusions that were already reached in the IA study.
- The market for hand held hedge trimmers is shrinking due to the development of battery powered products. It is thus possible that the emission limits related to this equipment become redundant by the end of this decade. No such development is expected for hand held chain saws.
- Some large manufacturers are close to finding technical solutions for stage II for tree service chain saws and hedge trimmers - these solutions will be protected by patents. SMEs are unlikely to be able to develop compliant equipment on their own. Thus, for SMEs, extending the exemption will not solve their specific problems. Taking into account the cost of licenses (10% of the sales price), **SMEs will be at a significant cost disadvantage compared to larger companies who own the intellectual property rights**. It can be expected that further exit from the market will take place. The **number of jobs at risk** at the EU level would lie between the **100 and 200 units**.

Besides these issues, concerns have also been raised with respect to the **rapid succession of stages in the NRMM Directive**, which put important strains on the R&D capacity of companies, and SMEs in particular.

A possible mitigating measure that would have an impact beyond the options under scrutiny in the IA would be to introduce **more flexibility in the current small volumes derogation**.

Two concrete proposals have been considered:

- **Using 5 year averages** instead of yearly figures **to determine the thresholds for eligibility**. Such a scheme would be beneficial to companies, but would come at a cost to the environment.
- **Abolishing the 5 000 units threshold for individual engine families** would also be **beneficial for companies**, and may, under certain circumstances, also be beneficial for the environment. However, the **net environmental impact depends** on the characteristics of the equipment under consideration. Taking into account these individual characteristics would effectively mean a move towards an ABT scheme such as in use in the US.

Both proposals would thus yield benefits for the manufacturing industry, but at the cost of some environmental impact. This **environmental impact is likely to be very small**, taking into account the low share of small SI engine emission compared to total NRMM emissions. In contrast, in the ABT scheme, the environmental effect is neutral when averaged over time and space, while the system also yields benefits in terms of reduced compliance costs. A possible disadvantage of the ABT system is that its enforcement requires more information and monitoring.

The main problem with the small volumes derogation is that **this system can only work if it is sufficiently enforced** (which, according to the industry, is not the case currently). While large companies have the means for monitoring the market, SMEs (for which the derogation had been designed) do not have these.

5 SI engines: snowmobiles

The IA study had concluded that no SMEs are involved in the manufacturing of snowmobiles. However, most snowmobile dealers, professional users and activities supporting snowmobile tourism are SMEs. The IA study had already covered extensively the possible employment effects amongst the professional users.

It had concluded that, under option 1 (alignment with the US but without the ABT):

- Employment amongst dealers could drop by 555 to 840 full-time equivalents (depending on the actual price increases of the fleet)
- The indirect employment effects in the tourist sector could be expected to be limited in absolute terms in the short run, but could run in the hundred fulltime equivalents in the long run.

We had also pointed out that the effects at the EU level were close to negligible, but that the negative employment effects would be very concentrated in areas with low population density and high unemployment.

On 05 May, we have asked the International Snowmobile Manufacturers Association to suggest, amongst the clients of their association, SMEs (or associations of SMEs) that could provide significant and representative inputs to the SME studies.

During a meeting on 15 May, ISMA pointed out that language could be an important barrier for professional users of snowmobiles if the questionnaire were to be submitted as such. The following approach was agreed to overcome this:

- ISMA members would send the questionnaire to their dealer network and to the SMEs amongst their suppliers, and would try to obtain at least one in-depth response each
- ISMA would also send similar questionnaires to professional end users (reindeer owners, holiday resorts) in Finland, Sweden, Norway, France, Italy, Switzerland.
- ISMA members would translate the questionnaire in "practical terms", so that they would be easier to understand for the dealers and professional end users; the contents of these adapted questionnaires would be first verified with ARCADIS, to be sure that they reflect the underlying questions to which we wish to obtain a response

ISMA informed us on 24 June that snowmobile manufacturers would each be contacting their dealers and suppliers and forwarding the SME questionnaires to them for completion and then have them sent back to ARCADIS.

A first response was provided by a small dealer based in Finland, selling a large variety of equipment (snowmobiles, snow throwers, boats, outboard engines, ATVs, lawnmowers, chainsaws etc) and providing after sales services. They employ about 10 people, and report that the size of their company is optimal for the region. Their very wide product range is explained by the need to run the business evenly over the year and to have a continuous cash flow – snow related products correspond to 70% of their sales, which is easily understood in the light of the long winters. A significant (but unspecified) share of their business comes from the safari companies, which are in turn dependent on winter tourism. The respondent reckons that he would be able to pass on cost increases to his customers but at the costs of his sales volume. However, no quantitative estimate has been provided.

As a possible mitigating measure, the respondent has suggested to introduce a longer transition period, which would enable the manufacturers to bring reliable and functional products into the market. However, this argument is inconsistent with the information that was gathered in the course of the IA study, where it had been concluded that Option 1 compliant equipment is already available.

A second response was provided by a small company selling travel packages: snowmobile safaris, husky safaris, reindeer safaris, canoeing, riverboat. They employ about 25 people on a permanent basis and approximately 100 seasonal employees – this is larger than most competitors, and they feel that this confers them a competitive advantage. They have pointed out that, due to the economic recession, demand is currently weak, but they also reckon that the market will recover quickly. Remarkably, they seem to prefer scenario 1 (alignment with the US without ABT) to scenario 0 (do-nothing) if the transition takes place gradually. It seems that one of the motivations behind this request lies in concerns regarding the environmental image of snowmobiles.

We can conclude that the **limited information** we have received from the affected sectors **does not affect the conclusions reached in the IA study**. One new element is the request to ensure that the alignment with the US standards takes place gradually. Under the current provisions of the Directive, there is no instrument that would make such a “gradual” transition possible:

- The flexibility mechanism only applies to CI engines, for reasons explained in Section 4.2.4 to this report;
- In general, the quantities produced by snowmobile manufacturers are too large to be eligible for the small volume exemption.

6 Landbased compression engines: construction and agricultural machinery < 19 kW and > 560 kW

No SMEs are involved in the production of engines for this market segment.

As already indicated above, the sector organisations have informed us that the number of SMEs amongst the OEMs is extremely limited. We have received no completed questionnaires through the channel of sector organisations. Our direct contacts with OEMs (see Section 3.5 for more details) have not lead to any response either.

For the impact on end users in the construction sector, we have contacted FIEC, the European Construction Industry Federation. On 05 August, FIEC informed us that they had passed on the contents of the SME test to their national member federations. However, they also raised concerns with respect to the technicality of the questions asked, and with respect to the barriers language could create for extremely small enterprises. They pointed out that SMEs have very limited resources, and will not answer a complicated questionnaire if they do not feel there is a direct interest for them. Finally, FIEC raised the question in what sense SMEs are different from other end users that justifies a separate treatment in the Impact Assessment. We have subsequently redrafted the questionnaires, limiting the questions to the most essential ones (effective share of each equipment type within the total cost structure of professional end users; impacts if very small CI engines would be replaced by SI engines; impacts if the production of some machinery would be discontinued). On 13 August, FIEC informed us that even this simplified version of the questionnaires would not answer the concerns raised by their members and consequently they would not organize a second circulation of the documents. No response from individual members has been received.

For the impact on end users in the agricultural sector, we have contacted COPA-COCEGA. A meeting to discuss the approach for the consultation has taken place on 14 July. As no response had been received from COPA-COGECA by the end of September, ARCADIS has submitted a thoroughly simplified questionnaire to COPA-COGECA with a renewed request to forward this questionnaire to the members. No answer has been received to date. COPA-COCEGA has also provided us with the contact details of 3 manufacturers of forest harvesters. However, none of them is an SME, as is apparent from the table below.

Table 4: Manufacturers of forest harvesters

Ponsse	In 2008, Ponsse had a turnover of 293 million EUR.
Timberjack	Timberjack have been a subsidiary of John Deere since 2000.
Komatsu	Komatsu as a group employs close to 40 000 people.

In conclusion, this study has identified **no new relevant information on this topic compared to the IA study**.

7 Landbased compression engines: construction and agricultural machinery flexibility

7.1 Introduction

In the IA study, we had reported that the market for construction and agricultural machinery contains up to 1500 players, which are supplied by approximately 20 engine producers. We had also pointed out that small producers producing different (niche) equipment types in small quantities might not have sufficient capacity to develop simultaneously solutions for all their products.

The NRMM directive already has a mechanism to help SMEs producing a wide variety of equipment to adapt their production gradually to new emission standards: the flexibility scheme.

This scheme allows an engine manufacturer to place on the market, during the period between two successive stages of limit values, a limited number of engines, to be installed in non-road mobile machinery, that only comply with the previous stage of emission limit values.

The number of engines placed on the market under a flexibility scheme shall, in each engine category, not exceed 20 % of the OEM's annual sales of equipment with engines in that engine category (calculated as the average of the latest five years sales on the EU market). This 20% percentage is currently under review.

As an optional alternative to section 1.2, the OEM may seek permission for his/her engine suppliers to place on the market a fixed number of engines under the flexibility scheme. The number varies between 50 for the engines in the 130-560 kW range and 200 for the engines in the 19-37 kW power range.

As principal advantage of the flexibility scheme, the IA study had reported the possibility to spread out the peak in R&D efforts over a longer period when several equipment types face more stringent emission standards. The flexibility scheme would allow equipment producers to adapt their larger volume equipment types in the first phase and the lower volume equipment types in a later phase. For instance, if a (hypothetical) OEM sells 500 machines using 20 kW engines per year, and 45 machines using 300 kW engines per year, the flexibility scheme allows this OEM to concentrate first his R&D efforts on the 20 kW machines, and to provisionally put the 300 kW machines on the market under the flexibility scheme.

In the context of this study, 2 SMEs involved in the production of agricultural machinery have provided us with supplementary information on how the flexibility scheme would affect SMEs. We have complemented the written questionnaires with in-depth phone interviews.

7.2 Case study 1

7.2.1 Description of the firm and its market

The first SME we have spoken with is active in the production of agricultural machinery, with only one product type covered by the NRMM Directive (self propelled potato harvesters). Its workforce varies between 80 and 100 full time equivalents (depending on the season), and the annual turnover is approximately 29 million EUR. Therefore this company falls within the category of medium-sized enterprises. The equipment covered

by the NRMM Directive has an annual turnover of approximately 5 million EUR, corresponding to 15 units per year.

The company faces 4 competitors for the equipment covered by the NRMM Directive – only one of them is not an SME (600-1000 people, with a total market share of 75%)[22]. The total turnover within the sector is between 20 and 25 million EUR. The market is growing slowly, but steadily (although sales in 2010 are expected to be low, due to low prices for agricultural products).

Taking into account rapid technological progress, the economic lifetime of potato harvesters is estimated at 8 years, but is technical lifetime exceeds 15 years and can even reach 20 years. The economic lifetime of tracked machines is higher than the average for self-propelled machines. Average use per year ranges from 200 to 500 hours. The purchase price of tracked harvesters can vary from 75 to 150 000 €, while the purchase price of self propelled harvesters varies from 250 to 550 000 €. Little information is available with respect to the second hand market. Technical progress in this sector is quick and leads to higher capacity, less maintenance, increased accuracy and user-friendlessness[23].

The main advantages of SP harvesters are their higher pulling power and their user comfort compared to tracked harvesters. Thanks to their higher pulling power they can be used longer throughout the harvesting season in regions with a lot of rainfall. However, SP harvesters are also more expensive and they therefore can only be profitable on large surfaces. They are thus used either by farmers who own large lands or by specialised contract workers (who own the harvesters themselves).

ING expects that self propelled harvesters will gradually gain market share at the expense of tracked harvesters. Sales fluctuate strongly from year to year – in general, farmers invest only after two subsequent good harvests[24].

SP potato harvesters are not exported outside the EU.

7.2.2 Advantages and drawbacks of size

This producer has made the following assessment of the disadvantages of being an SME:

- high share of fixed costs for R&D
- high share of fixed costs for marketing (especially those linked to hiring exhibition room on trade fairs and to designing leaflets and websites)
- high fixed costs linked to testing and conformity assessment; in France and Germany, homologation is required before the machine is allowed to travel on the road; testing and homologation correspond to a total cost of about 15,000 Euro per country.
- weak negotiating position with respect to suppliers: difficulties to obtain discounts

However, this SME has also pointed to some advantages linked to its small size:

- Because of the limited numbers sold, they can release new product developments quicker to the market; in the case of field problems, the cost of a possible rebuild program is also limited.

[22] The company has provided us with the contact details of its other competitors, who will be contacted shortly in the context of this study.
[23] ING Economisch Bureau, (2008), Landbouwmachines (in Dutch only).
[24] ING Economisch Bureau, (2008), Landbouwmachines (in Dutch only).

- As the number of possible customers is limited, it is easier to have direct contact with most of them; this helps to develop what the customer really needs.

The engines are not designed in-house, but are purchased from an engine manufacturer. This OEM reckons that, due to the tighter emission limits, engines become heavier and more expensive, and it becomes more difficult to integrate them in the equipment.

7.2.3 Mitigating measures

Two measures to mitigate the costs for the OEAM have been discussed:

- Expansion of the flexibility scheme in order to reduce warranty costs and teething problems
- Measures to reduce homologation costs

We discuss them in turn.

First, this manufacturer would like to see an increase in the number of engines that can be put on the market under the flexibility scheme ("fixed number variant") to 125.

In this case (and taking into account that the other equipment produced by this SME is *not* covered by the NRMM Directive), the argument in favour of flexibility does not depend on possible peaks in the R&D effort we have discussed above. Indeed, the re-design of equipment when a new engine type is introduced requires just about 1 month work for 2 full time equivalents (working at 70-80 EUR per hour, overhead included). After that, production of the new harvester starts – this SME does not work with prototypes.

However, an increase in flexibility would allow this SME to meet market demand during 5 years and thus to effectively skip stage IIIB and move directly to stage IV. In the meanwhile, they expect that the engine manufacturers will have solved the design faults (even those linked to stage IV) that will appear when large equipment manufacturers integrate the engines in their equipment. An extension of the flexibility scheme would allow to save on warranty costs, which amount to 1-2% of the turnover for this product category.

Second, in order to avoid the costs linked to homologation, it is conceivable technically to move the harvester from one field to the other with a truck. However, this does not happen in practice, mainly because of the high investment and operational costs of such a solution. Moreover, the harvesting of a field usually takes place in several batches. Indeed, especially in the beginning of the harvesting season, potatoes are sold piecemeal wise (depending on the market price of potatoes on the one hand, and the need to free space for the growing of other vegetables on the other hand). For independent contractors, this means that the harvester needs to be moved frequently from one field to the other. This would imply a very intensive (and far from cost-efficient) use of the transporting truck. Therefore, in practice, homologation for use on the road is necessary. European standardisation of the homologation requirements could reduce the costs linked to homologation.

7.3 Case study 2

The 2nd SME we have spoken with is a completely privately owned family business and employs approximately 60 people. It falls within the definition of a medium-sized enterprise. The equipment covered by the NRMM Directive (self-propelled sprayers) represents approximately 50% of their turnover (15 million EUR). About 14 people are directly employed in the production of these sprayers, and about 3 full time equivalents in the R&D department.

There is a limited number of competitors that also fall under the definition of SMEs[25]. However, in the evaluation of the market, it is important to take into account that the equipment is often marketed under the brand name of SMEs that have been taken over by large groups - this may give the (false) impression that there are a lot of SMEs operating in this market segment.

SMEs produce mainly tailored made solutions for their clients, while the large groups are mostly involved in mass production. High costs linked to R&D and to testing and conformity assessment are mentioned as specific competitive disadvantages. There are no real issues of competition by noncompliant producers.

Sales are very dependent on the fluctuations in the prices of agricultural products. Less than 2% of annual sales are exported outside the EU.

This SME has reported the following implications of new emission limits on their production activities:

- Their engine supplier has informed them that the next stage in the NRMM Directive will lead to a 30% unit cost increase.
- With every new stage in the Directive, new sensors are added to the engines and new software is needed to access the reading of the sensors. The demonstration of the software (corresponding to a half day of work at 500 EUR) needs to be complemented with on the job training, during which the technicians are not available for other work.
- When a new engine is introduced, they need a homologation from the DRIRE before they can put the new equipment on the French market. UTAC[26] performs the necessary tests.
- This homologation has to be requested up to 8 months in advance. The internal work related to the homologation procedure for a new machine typically corresponds to a 6 months long full time job (which can run in parallel with the homologation request). In case a new engine is installed on an existing machine, a new homologation is necessary, but the execution time is more limited – in the best case, there is a gap of 9 months between the date when the homologation was requested and the date where imports in France can start. The administrative delays *after* the tests have been performed constitute the most important bottleneck.
- The homologation strictly speaking takes one day, for which UTAC charges approximately 5000 EUR.
- The typical time scale when a new engine is introduced is: (a) when a new engine is put on the market, the manufacturer has to adapt the machine (requiring more or less two days of work) and construct a prototype; this prototype runs for about one year in real life conditions (b) the manufacturer starts a pre-series 1 years after the engine was first put on the market and they request the services of UTAC (c) homologation can be expected 6 to 12 months after the prototypes were developed.

The long cycle described above explains why an extension of the duration of the flexibility mechanism would be beneficial to them. Moreover, this SME requests to double the number of engines that can be put on the market under the flexibility scheme.

[25] The company has provided us with the contact details of SMEs amongst its competitors, who have all been contacted in the context of this study. No other responses have been received, however.
[26] Union Technique de l'Automobile du motocycle et du Cycle (UTAC).

This SME has also pointed to an unanticipated side-effect of the flexibility scheme. In order to reduce the administrative burdens related to the flexibility mechanism, this manufacturer has reduced the engines types in use to two. However, this leads to distortions, as the average power in the "low category" is too high, and the average power in the "high category" is too low.

Finally, in this case as well, the OEM has informed us that it is not realistic to avoid the homologation requirement by transporting the machine by truck when it needs to be moved on the road. Due to height restrictions, parts of the machine would need to be disassembled. Often, the distance between the fields is just a few hundred metres: disassembling, mounting, unloading and reassembling the machine would then be disproportionally time consuming. Moreover, in some cases, the truck would even need to be adapted. The investment linked to a towing truck is also substantial (over the 75 000 EUR), certainly for independent contractors.

7.4 Conclusion

On top of the advantage already identified in the IA study (flexibility allows to overcome R&D peaks when several products are faced simultaneously with stricter emission limits), we have identified the following additional advantages:

- An **increase in the fixed number of engines allowed** on the market **under the flexibility scheme** would allow SMEs to completely **skip the teething problems of new engines**, which would then be entirely borne by the large manufacturers.
- An extension of the duration of the flexibility scheme would **allow small equipment manufacturers to overcome the time lag between the development of a new engine and the full integration of this new engine in the equipment** (including homologation for use on the road)[27].

Concerning the second point, it is not clear to what extent this issue is important in practice: after all, one would expect that engine suppliers could use an active anticipation of this time lag as a competitive advantage. In this context, it is worthwhile to mention that the U.S. Environmental Protection Agency has published a direct final rule providing non road diesel equipment manufacturers with a production technical relief provision. The provision is for equipment manufacturers that do not make the engine used in their equipment. Moreover, they need to demonstrate the technical need for a non-vertically integrated product and that they were unable to complete the redesign during transition due to the fault of the engine supplier. The application of the provision requires documentation of the technical or engineering problem that was unsolvable within the given lead time. The equipment maker would have to make and describe all efforts to find other compliant engines for the model[28]. Up to this point, all applications for this relief provision have failed these tests[29].

Another important point to note is that the **flexibility scheme leads to distortions in the range of engine types** that are put on the market.

[27] One puzzling issue is why engine manufacturers do not take into account these long delays encountered by OEM in their own production schedule. We have discussed this issue with an integrated manufacturer of agricultural machinery, who has confirmed that, even within vertically integrated companies, it will be difficult for the OEM to meet the deadlines for the next stages. We have no satisfactory explanation for these delays.
[28] http://www.epa.gov/nonroaddiesel/420f07055.htm
[29] Informal communication from the European Commission.

The SMEs interviewed in this process have both provided us with contact details of other SMEs active in the sector. We have contacted these SMEs in order to obtain new case studies, but none of them has responded positively to our invitation. Therefore, it is difficult to assess how representative the cases described in the chapter are.

8 Landbased compression engines: Special agricultural tractors used in vineyards and orchards

8.1 Impact on producers

The IA study had concluded that 45% of the tractor market is in hands of SMEs. Discontinuation of the production of this type of tractors would put them out of business.

T2 (narrow wheeled) tractors and C2 (narrow tracked) tractors are produced in Italy and Germany only. After thorough investigation, the 3 manufacturers that were indicated as SMEs turned out to have a workforce between 250 and 300 people[30]. Therefore, they do not qualify as medium enterprises according to the EC definition. We will therefore no longer pursue the issue of the T2 and C2 tractors in this section.

The T4.1 (high clearance) tractors are a typically French product.

95% of the market is held by Bobard and Tecnoma. Bobard is an SME, while Tecnoma is part of the Exel group. The remaining 5% is held by very small producers, who sell at most 10 to 20 tractors per year. The market has gone through a consolidation phase in the 1990s, which is indicative of the existence of economies to scale.

According to Bobard, this market is a small one. Industry sales amount to 500-600 units per year. 90% of these are sold in France while the remainder is exported to Switzerland or to Central and Eastern European countries.

Sales (in units) at the industry level have decreased by 12% in 2007-2008 and by 12-15% in 2009. This decrease is largely due to the on-going economic recession, and not to structural factors.

On the contrary, due to an ongoing consolidation of the viticulture sector, the average surface area of individual enterprises is increasing. Clients are requesting products of ever increasing precision. Thus, while the number of tractors sold is decreasing, the unit price of tractors is increasing.

Actually, demand can be expected to increase in the future. In France, the Grenelle de l'Environnement has requested a decrease of pesticide use in agriculture with 50%[31], which should lead to increased mechanical weeding (and thus to an increase in demand for high clearance tractors).

Besides Bobard, we have identified 3 other producers of high clearance tractors. One of them declined to allow an interview due to time constraints. This leaves us with three case studies based on telephone interviews.

8.1.1 Case study 1

Bobard produces only high clearance tractors (T4.1) which are used in narrow vineyards. According to Bobard, horses are the only technical alternative to this type of tractors.

Currently, Bobard sells about 250 tractors per year, in 5 different models. With an average lifetime of 3 years, this means that fixed development costs have to be amortized over a series of 150 tractors.

The large number of models is explained by the diversity of terrain conditions (relief, plantation width) on which vineyards are built.

[30] Personal communication by Dr Billi (24 November 2009).
[31] see: http://www.legrenelle-environnement.fr/grenelle-environnement/IMG/pdf/Fiche_6.pdf

The relative share of fixed costs is increasing through time. The development costs linked to the integration of an engine complying with a new stage of emission standards correspond to one full time project engineer during one year (to which one has to add the homologation costs, which vary from 12 000 to 15 000 EUR, depending on the tractor type). These resources are then unavailable to meet new technical requirements from the clients. Bobard can manage the development of 3 new projects per year. Each new tractor type requires 23 months as a prototype.

The typical sales price of an T4.1 tractor sold by Bobard lies in the range 70 000 to 85 000 EUR.

The typical economic lifetime (in use) a T4.1 tractor is 7 to 10 years. If a tractor is used beyond this period, annual maintenance costs can be expected to increase from (approximately) 1500-2000 EUR per year to 3000-4000 EUR per year.

Bobard has suggested to have a longer time interval between subsequent stages. Bobard does not take advantage of the flexibility scheme. Their main motivation for not doing so is that they are uncertain whether their engine suppliers will be able to supply engines that comply with the previous stages of the Directive, whilst they have already started the production of engines complying with the next stage. With a longer time interval between subsequent stages, the product cycles of engine and tractor producers would be synchronised.

Bobard estimates that the homologation of a new tractor for use on the road requires 7 to 8 weeks of internal work, and between 15 and 23 weeks before approval of the DRIRE is obtained.

8.1.2 Case study 2

VSP Construction is a family business in the category “micro enterprises”. 90% of their turnover (1 200 000 EUR) originates from the sale of T4.1 tractors. This corresponds to 10-15 tractors per year. Occasionally, they also sell tracked tractors.

6 employees (out of a total of 17) are directly involved in the production of T4.1 tractors. The production of the frame is subcontracted to their sister company C2MH – this corresponds to 2 indirect jobs.

The vast majority of their sales take place in France; although they also occasionally sell on the Belgian market.

Their principal activity consists in the production of customized high clearance tractors. This is not limited to applications in vineyards; their clientele consists of firms who do not find suitable solutions in the mass market. Non-vineyard applications include tractors for picking up algae under the water level or for picking up boulders from fields. However, vineyard applications still constitute 90% of their turnover.

Another competitive advantage is a shorter delivery time than some of their competitors.

A disadvantage compared to larger manufacturers is that the share of development costs is relatively high (one sixth of the payroll). However, their activity is not capital intensive and depreciation of physical capital is not an important cost category[32].

On average, this company sells its tractors at a unit price of 100 000 EUR, which is significantly higher than the prices quoted by Bobard. This confirms that this producer does not compete on price.

[32] No concrete figure has been given.

Their main concern is related to the homologation costs. All tractors using public roads (even for very short trips) have to be homologated[33]. Every time a new engine is installed, the producers need to go through the whole homologation procedure, even if the tractors are otherwise identical. The development of a new tractor requires on average 3 to 4 months. The test (pollution, brakes…) are undertaken under the surveillance of UTAC, who prepare the homologation dossier for the DRIRE. This requires approximately 10 working days. Although, in theory, the homologation file should be processed within 45 days, this can take up to 1 year in practice.

As it is allowed to sell non-homologated tractors as long as they do not use public roads, some vineyards use trucks to move the tractors on the public roads. However, this solution requires the winegrower to obtain a driving licence for trucks. Moreover, it is far from obvious to load and unload tractors. Therefore, for short distances, users prefer to take the road.

VSP's engines suppliers are already capable of supplying stage IV compliant engines, at a price that is 50% higher than engines that meet the current emission limits. As already reported in the JRC report and the IA study, these engines take much more place and limit the manoeuvrability of tractors in the vineyards.

As a supplier of customized products, VSP feel that they cannot adapt their designs pro-actively, as they cannot anticipate the specific client needs that will arise in the future.

VSP has no specific comments on the NRMM Directive in itself – for them, the priority should be a simplification of the homologation procedure (which falls outside the scope of this study). They point out that, as end users sometimes adapt the tractors themselves, without being subject to the slightest control, these heavy and costly procedures are circumvented anyway.

8.1.3 Case study 3

FREMA is a small company with 12 employees (2 of which are working on development). They have a turnover of 5 million EUR, which is uniquely composed of high clearance tractors. Their annual production corresponds to 50 tractors, which are sold at a price that varies between 50 000 and 100 000 EUR, depending on the model.

Their main competitive advantages compared to larger producers are their higher flexibility and proximity to the clients. They sometimes produce tailor made tractors, but most of their production is made in series.

Homologation of new machines is a major concern. The tests by UTAC cost 2 500 EUR. The subsequent approval of the file by the DRIRE can take between 6 months and a year. As already pointed out above, it is legally possible to sell tractors that have not been homologated if they do not circulate on the roads. However, in FREMA's experience, clients do not accept this possibility. An important problem is that the French homologation for the road is not recognized in the countries to which they export (such as Germany and Austria). This is due to different standards (for instance, with respect to the brakes). Every time a new engine is installed in a tractor, the whole homologation procedure has to start all over again.

FREMA has confirmed the usefulness of the flexibility mechanism.

The high clearance tractors for vineyards are sold uniquely in France. FREMA also sells high clearance tractors for cereals (seed corn, sunflowers, tobacco). These are also exported, mainly to Europe, but also to Latin America (where no regulations on emissions

[33] By the DRIRE, the Directions Régionales de l'Industrie, de la Recherche et de l'Environnement.

exist). Exports outside the EU correspond to 4-5 tractors per year (sales of 300 000 EUR). This firm is thus heavily dependent on the EU market.

8.2 Impacts on professional users

For the impact on end users in the agricultural and vineyard sector, we have contacted COPA-COCEGA. A meeting to discuss the approach for the consultation has taken place on 14 July. As no response had been received from COPA-COGECA by the end of September, ARCADIS has submitted a thoroughly simplified questionnaire to COPA-COGECA with a renewed request to forward this questionnaire to the members. No answer has been provided to date.

Concerning the impact on vineyards, we have consulted with the European Confederation of Independent Winegrowers (CEVI). CEVI represents European independent winegrowers. In the case of independent winegrowers, the whole process (vine growing, harvesting, winemaking and wine selling) is fully vertically integrated. CEVI represents 9000 members. The total number of independent winegrowers in Europe is estimated to be, in total, from 180,000 to 200,000. A large number of these winegrowers produce only for household consumption, but no reliable estimate exists of the number of winegrowers who sell their products.

The large majority of independent winegrowers are micro-enterprises, generally family owned. Only a very small minority are small enterprises. In France, the “very big estates” of independent winegrowers account for 2.5 % of all the independent winegrowers’ estates, where “very big” refers to estates of 10 employees on average and a surface of 84.4 ha[34]. CEVI reckons that the proportion is roughly the same in the other countries. None of these enterprises are medium.

As pointed out in the IA study, in the absence of stage IIIB and IV tractors, the end users have two options:

- Redesign existing vineyards to fit compliant tractors
- Maintain the old tractors until a technical solution has been found for new tractors

Let us discuss the economic implications of both in turn.

8.2.1 Redesign of existing vineyards

In the case of vineyards, it is useful to first consider the possibilities for public support that exist for restructuring existing vineyards:

> Since the entry into force of Regulation (EC) N°1493/1999, recently amended by Regulation (EC) N° 479/2008, the common organisation of the market in wine has provided for the possibility for Member States to give support for the restructuring and conversion of vineyards.
>
> Chapter 1 of the Regulation lays down the rules governing the attribution of Community funds to Member States and the use of those funds by Member States through national support programmes (hereinafter referred to as support programmes) to finance specific support measures to assist the wine sector. According to Article 4, Member States shall be responsible for the support programmes.
>
> According to Article 11 of Regulation (EC) N° 479/2008, the objective of measures relating to the restructuring and conversion of vineyards shall be to increase the competitiveness of wine producers.

[34]The average independent winegrower’s estate in France is 12.3 ha

> Support for restructuring and conversion of vineyards may only cover one or more of the following activities:
>
> (a) varietal conversion, including by means of grafting-on;
>
> (b) relocation of vineyards;
>
> (c) improvements to vineyard management techniques.
>
> The normal renewal of vineyards which have come to the end of their natural life shall not be supported.
>
> Support for restructuring and conversion of vineyards may only take the following forms:
>
> (a) compensation of producers for the loss of revenue due to the implementation of the measure;
>
> (b) contribution to the costs of restructuring and conversion.
>
> Compensation of producers for the loss of revenue may cover up to 100 % of the relevant loss. The Community contribution to the actual costs of restructuring and conversion of vineyards shall not exceed 50 %. In regions classified as convergence regions, the Community contribution to the costs of restructuring and conversion shall not exceed 75 %.

Summarising the text above, Member States could thus decide to provide financial support for the adaptation of the row width of vineyards in order to allow the use of tractors[35].

However, it is not clear whether financial compensation would be enough to compensate winegrowers for the other drawbacks of redesigning the vineyards. Indeed, CEVI has argued that in vine growing, a higher planting density guarantees a better quality of the grapes, and that this explains why the European Community supports replanting with a higher density[36]. Redesigning the vineyards to better accommodate special tractors would run counter to this objective. However, the relation between planting density and grape quality is controversial[37].

We do not think it would be worthwhile to further deepen this issue here, as it is of relatively minor importance compared to the financial implications of adapting the row widths one more time. Indeed, in the first seven years of application of the scheme, 400 to 465 million EUR were allocated *annually* to restructuring and conversion measures[38].

The IA study had shown a *total* environmental cost of 120 million EUR in case the special purpose tractors would be exempted from stage IIIB and stage IV. This figure is obviously very low compared to the financial implications of a redesign of existing vineyards and orchards. Of course, not all existing vineyards would need to be redesigned. However, the figure above does suggest that the cost of adapting the row width can be significantly higher than the environmental cost of exempting the special purpose tractors from stage IIIB and IV.

Moreover, adapting the row width in itself would lead to the release of carbon, which is also an environmental cost. CEVI admits that no independent estimate of these releases exists.

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[35] Personal communication from DG AGRI.
[36] However, in the text of the Regulation (EC) N° 479/2008, no explicit reference to density is made.
[37] Cesare Intrieri and Ilaria Filippetti. Proceedings of the ASEV 50th Annual Meeting, Seattle, WA, June 19-23, 2000, pp 296-308
[38] http://ec.europa.eu/agriculture/markets/wine/prod/depens.pdf

8.2.2 Maintenance of old tractors

In Section 8.1 we had reported that if a high clearance tractor is used beyond its economic lifetime, annual maintenance costs can be expected to increase from 1500-2000 EUR per year to 3000-4000 EUR per year.

For illustrative purposes, we assume that the cost increase is 2 500 EUR per year per tractor, and that all special tractors face the same increase in maintenance costs as the high clearance tractors. To remain consistent with the IA study, we assume that a technical solution can be found 5 years after the planned introduction date of the next emission stage, that a total of 25 600 units are sold per year in the EU and that a discount rate of 4% applies.

For the T4.1 tractors, based upon the response received during the consultation, we assume that 400 units are sold per year.

To the best of our knowledge, no data on the sales of C2 tractors are publicly available[39].

Thus, in total we assume that 26 000 special tractors are sold per year.

We assume that all sales correspond to replacement sales and that, once the technical solution has been developed, old tractors are replaced at a rate of 26 000 units per year.

The table below gives then, for each year after the planned introduction of stage IIIB until all "old" tractors have been replaced by stage IIIB compliant tractors, the *increase* in the number of tractors that are kept in use beyond their economic lifetime and the implied extra maintenance costs at the EU level.

Table 5: Extra maintenance costs for special tractors used beyond economic lifetime

Year	Number of tractors kept in use	Extra cost per year
1	26000	65.000.000
2	52000	130.000.000
3	78000	195.000.000
4	104000	260.000.000
5	130000	325.000.000
6	104000	260.000.000
7	78000	195.000.000
8	52000	130.000.000
9	26000	65.000.000

The net present value of these costs (discounted to the planned introduction of stage IIIB) is 1 339 million EUR. This is an order of magnitude higher than the environmental benefits linked to not postponing stage IIIB with 5 years (120 million EUR).

Thus, even if actual higher maintenance cost would be significantly lower than suggested by the manufacturers, the costs of not postponing stage IIIB would still be much higher than the benefits.

8.3 Conclusion

On the producers' side, no SMEs are involved in the production of special agricultural tractors, except in the niche of high clearance tractors. This market represents less than 2% of the total market for special tractors in Europe.

The following points are noteworthy:

[39] This has been confirmed in a personal communication by Dr Krasenbrink of the JRC.

- Although the **OEMs** we have interviewed know that the machines they produce are regulated by the NRMM Directive, some of them **did not appear to understand fully the implications of the next stage in the Directive**. Some of the smaller companies are not affiliated to professional associations, and were not aware of the on-going legislative process until the phone interview. It was therefore sometimes difficult to keep the phone interview focused on the subject at hand.
- Maybe because of this lack of information, the **most important concern raised** was not the next stage in the Directive, but the **homologation process**. The points raised by the producers of special tractors were almost identical to those discussed in Chapter 7: the length of the process, the lack of international standardisation and the fact that even minor changes require rerunning a complete homologation process. The possibility to sell non-homologated tractors and to use trucks to move them on the road was rejected as unrealistic. One manufacturer has pointed out that the **homologation procedures** are sometimes **circumvented by the end users**, who adapt tractors to their own needs without any external control.
- Most manufacturers that we have interviewed are aware of the flexibility scheme, but not all seem keen on using it. One manufacturer has raised the specific concern that the engine suppliers may not always be able to supply engines complying with the previous stage of the Directive[40].
- This **very small market is further divided in subniches** determined by the diversity of terrain conditions on which vineyards are built. This implies that producers have to amortize fixed development costs (including homologation costs) over very small series. The **rapid succession of stages in the Directive exacerbates these problems**. At least one producer has suggested to introduce longer time intervals between successive stages of the Directive.

Regarding the impact on **orchards, no information** (even indicative) has been obtained from the relevant professional organisation.

Regarding the impact on vineyards, the European sector federation has confirmed that all independent winegrowers are SMEs, and the vast majority are micro-enterprises.

Using figures on existing public support schemes, we have argued that the **cost for redesigning vineyards** to accommodate stage IIIB and IV compliant tractors **would be several orders of magnitude larger than the environmental cost of *not* exempting the special tractors from stage IIIB and IV**. Moreover, such a policy would run counter to the existing policy to stimulate a higher plating density.

The alternative option would be for vineyards to keep old tractors in use beyond their economic lifetime. Our calculations suggest that the **increased maintenance cost** following from this option would be an **order of magnitude larger than the environmental cost of *not* exempting the special tractors from stage IIIB and IV**. As another way to put these compliance costs in perspective, one could note that they are of the same order of magnitude as the compliance costs linked to the Euromot proposal for inland waterway engines.

[40] In other applications, engine manufacturers keep on producing engines complying only with previous stages of the Directive, but these engines are exported to unregulated regions of the world. We have to keep in mind that this chapter treats a niche market, where this outlet does not necessarily exist.

9 Landbased compression engines: Snow groomers

The IA study had concluded that no SMEs are involved in the manufacturing of snowgroomers but that some of the clients (cableway and ski lift operators) fall within this category.

We have conducted two in depth telephone interviews to better understand the specific situation of these businesses.

9.1 The market for cable lift operators

The structure of the market of cable lift operators varies significantly from country to country.

The *Companie des Alpes* operates the following ski resorts:

- France : La Plagne ; Tignes ; Les Arcs ; Les Deux Alpes (acquired November 2009) ; Les Menuires ; Le Grand Massif ; Meribel Alpina ; Peisey-Vallandry ; Chamonix - Compagnie du Mont Blanc ; Serre Chevalier ; Val d'Isere ; Avoriaz, La Rosière
- Italy: Courmayeur

With consolidated sales and balance sheets well over the 400 million EUR[41], the *Companie des Alpes* can definitely not be considered an SME.

To the best of our knowledge, the only competition *Compagnie des Alpes* faces from similar companies in Europe is:

- Employment at *Titlis Rotair* exceeds the threshold level of employment, and the company only operates in Switzerland.
- *Rothornbahn und Scalottas AG* is based in Switzerland.
- *Skistar AB* owns and operates alpine destinations in Sälen, Åre and Vemdalen in Sweden and Hemsedal and Trysil in Norway. With over 1,000 employees, it does not fall within the definition of SMEs.

According to one of the cable lift operators we have interviewed, the rest of the European market is split 50/50 between publicly owned and privately owned companies. All these companies are SMEs. The privately owned companies are all owned by local people (hotel owners, shop owners…) who see the cable lift operations as a complement to their own business, and who therefore do not always require a high return on investment (or who do not require dividends to be distributed). The 50/50 distribution is a European average, and practices can differ widely from country to country (in the Dolomites, for instance, most companies are private, while in Aosta and France, they are mostly publicly owned).

In most ski areas, operators accept each others' ski passes. The revenues from ski passes go into one common pool and are subsequently redistributed amongst operators according to the use of their infrastructure. This means that, *within a ski area*, no price competition takes place: all competition is at the level of the quality (including the quality of the slope). Due to high marketing costs, no stand alone operators could survive. The details of the arrangements can vary from region to region.

[41] http://www.compagniedesalpes.com/en/ca_consolide.asp and http://www.compagniedesalpes.com/en/structure.asp

9.2 Case study 1

9.2.1 Company presentation

The first stakeholder we have talked with is a private company, operating in the Dolomites, with about 550 local shareholders. They employ about 15 people in the summer and 70 in the winter (all year average of 48). Their annual turnover ranges from 12 to 14 million EUR (99% in winter time). They reckon that most of their direct competitors in the Dolomites are smaller.

They own 11 snow groomers for the preparation of the slopes (no snow farming takes place). One of these is used for cross country ski trails, all the other for Alpine ski slopes.

9.2.2 Cost and technical data

The investment cost linked to a new machine ranges from 250 000 to 340 000 EUR. Investment costs have been increasing through time - the low level of competition in snow groomer manufacturing has been referred to as one possible reason for this trend.

The average annual cost of a snow groomer varies from 30-40 000 EUR per year (snow groomers used for cross country ski trails) to 70 000 EUR per year (for Alpine skiing slopes). This cost figure includes 15 to 20 000 EUR for spare parts per year but does not include the personnel cost for driver and mechanics nor fuel consumption. Snow groomers operate for approximately 900-1000 hours per year.

On average, a snow groomer consumes 25 litres per hour - this can reach 30 litres per hour if a winch is used (as is the case on very steep slopes).

This operator has invested in a large filling station for diesel located in the snow groomers operating area (corresponding to an investment of 200 000 EUR). This station can be filled in the summer time at the normal diesel price. Taking into account the harsh weather conditions, they have to buy winter diesel (When bio diesel was first added, they had problems with the low temperature and the diesel froze).

They operate snow groomers for a period of approximately 8000 hours (in other areas, life time ranges from 6000 to 10 000 hours). After 8000 hours, a lot of mechanical problems start occurring and the snow groomer is sold back to the manufacturer for a price of approximately 20 000 EUR. The old snow groomers can then be sold on the second hand market (for instance, to very small ski lift operators) or used for their spare parts.

Out of the 10 snow groomers used on the Alpine slopes, one is permanently kept as a spare.

9.2.3 Experiences with the NRMM Directive

Snow groomers are produced in very small series, which effectively means that the equipment in use is essentially developed with the final costumer - it is tested while in operation. 9 out of the 10 snow groomers in operation for Alpine slopes are already different due to the previous changes in the NRMM Directive and continuous product improvements. Every time a machine is changed, this operator encounters a lot of initial problems. For instance, when particulate filters were first introduced, they performed well at normal slopes, but the machine would lose its power at higher altitude. End users would like changes to the machines to be grouped in a few big steps, rather than the piecemeal approach that is current practice.

This operator has not noticed a discernible effect of more stringent exhaust gas limits on their fuel consumption. Whilst engines become heavier following more stringent emission limits, other components (the cabin, chains etc) become lighter.

9.2.4 Expected impact of stage IIIB

Their annual purchases of new snow groomers follow the following circle: 1 1 2 1 1 2 etc. When stage IIIB enters into force, this operator could stop the purchases for 2 years. However, they think that it is nearly impossible to drive for more than 10 000 operating hours, and, in the third year, purchases would be needed. They do not consider a major overhaul of the machines to be a viable option.

In practice, the extra purchase cost is only part of the extra cost. The introduction of new technologies would also lead to an increased number of disruptions and to higher maintenance costs. Disruption during the night can be especially costly in terms of labour costs, even if no spare parts are needed (for instance, in case the diesel freezes, electronic setup, or other new parts). These extra costs also include the use of urea and additional weight if SCR is introduced[42].

Our respondent was not able to quantify these costs.

9.3 Case study 2

9.3.1 Company presentation

The second stakeholder we have talked with is the manager of the municipal machinery department of a ski area in the Bavarian Alps.

This ski area is a glacier ski area, situated at 2600-3000 meter and with 6 ski lifts of (on average) 1 km of length. As the glacier is melting under the influence of climate change, it is important to have snow covering the stones at the beginning of the skiing season. German environmental regulations forbid the use of artificial snow above 2000 meters[43].

In order to deal with this prohibition, the affected ski areas have to use "snow farming": at the end of the skiing season, snow is put together on a big pile and covered by a plastic sheet. These ski resorts therefore need more snowgroomers than ski areas in other countries where the use of artificial snow is not regulated[44]. Moreover, this ski area is subject to very low temperatures in the winter and therefore uses 9 snow groomers (where most ski operators of the same size have 5 to 6 snow groomers).

The company was independent until 2000 but has been taken over completely by the municipality. It has 32 employees.

9.3.2 Cost and technical data

The purchase cost of a snow groomer depends on the size of the machine. For the larger machine (> 350 hp), the purchase cost is 250 to 270 000 EUR.

The actual lifetime of the machine varies. For up to between 5000 and 6000 working hours (corresponding to 6-8 years for this respondent) the average maintenance costs per year for a snow groomer remain roughly constant. According to this stakeholder, a general overhaul of machine[45] allows to avoid increasing maintenance costs. However, most ski areas keep snowgroomers in operations for 4 to 5 years, and replace them once a major overhaul is needed.

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[42] Which will be the case if the introduction date of Stage IIIB does not change.

[43] The aim of this regulation is to protect these areas with sensitive vegetation from the quite dense machine snow and also to avoid possible erosion through the digging of ditches for water and electric supply for the snow guns.

[44] In practice only two ski resorts in Germany are affected by this regulation: Zugspitze and Oberstdorf. The toal number of employees working at this altitude is below 100. For example Zugspitze has two more ski areas under 2000m, which are not affected by this regulation.

[45] Including the repair or replacement of all major components of the machine (engine, hydraulic pumps, gearboxes, etc.).

In this company, the costs for such an overhaul are roughly 30.000 to 40.000 €. After this overhaul, the machine can operate for 3 to 4 more years with the same maintenance costs as before.

The total annual cost related to snow groomers is 75 000 EUR per machine (assuming 800 hours of operating hours per year). This figure includes depreciation, fuel consumption, maintenance costs and all other operating costs. This can be further split as follows:

- A snowgroomer consumes on average 22 to 25 litres per hour (and thus up to 20 000 litre per year). As there are no roads leading to the areas where snowgroomers operate, the fuel has to be brought by train and cable lift, leading to an average price of 1.50 EUR per litre of diesel, and thus to 30 000 EUR fuel cost per machine per year. The increase in fuel consumption over the lifetime is reckoned to be negligible.
- This respondent claims to have a very good maintenance team and keeps its snow groomers for a period of up to 10-12 years (up to 10 000 operating hours), including the major overhaul. This then corresponds to an annual depreciation cost of 21 000 to 27 000 EUR (depending on initial purchase cost and actual life time).

9.3.3 Experience with the NRMM Directive

The respondent claims that until now, every new stage in the NRMM Directive has led to a noticeable increase in fuel consumption.

To illustrate this, he has provided us with his calculations of average fuel consumption for the years 2000 to 2008. As every single snow groomer has an own number and an own electronic identification code for the filling station, the average fuel consumption of every machine can be calculated very precisely. In these years, the ski area used basically two types of PistenBully`s for grooming, which were available with different NRMM limits over these period:

- PistenBully 300 with 330 hp – available with stage I and stage II (engine Mercedes Benz OM 926 LA)
- PistenBully 300 POLAR (later PB 600) with 430 hp – available with stage II and stage IIIA (engine Mercedes Benz OM 457 LA / OM 460 LA)

The table below the average fuel consumptions of the different models:

Table 6: average fuel consumptions of snow groomers

Type of PistenBully	NRMM limits	Average fuel consumption	Working hours (for calculation)
PB 300	Stage I	18,06 l/h	6929 hours
PB 300	Stage II	21,34 l/h	2418 hours
PB 300 Polar / PB 600	Stage II	25,29 l/h	3174 hours
PB 300 Polar / PB 600	Stage IIIA	25,69 l/h	3237 hours

For all calculations, they used the data of two machines of the same type (except for the PB 300 stage where they used the data of three machines). For the PB 300 there is a rise in fuel consumption from stage I to stage II with 3.25 litres per hour. For the PB 300 Polar / PB 600 the increase in fuel consumption from stage II to Stage IIIA is not as high, but it is still significant.

9.3.4 Expected impact of stage IIIB

If stage IIIB is introduced as planned, this operator would keep the existing machines in use longer, as he has no confidence in the system that would be used for stage IIIB - he also thinks that maintenance costs would be higher with stage IIIB machines. He would only buy stage IIIB machines if one of his existing machines would break down. On average, 1 machine per year is purchased, but purchases can be very unevenly spread over time. This respondent thinks he could cover the transition period to stage IV with the existing machines.

Ski companies usually do not receive any public support (except, in some cases, the very small ones, operating just 1 ski lift).

9.4 Cost estimates

In the IA study, the approach has been to assume that relevant compliance costs are the stage IIIB extra investment costs in after treatment systems for snow groomers coming into service between 2011/2012 and 2014. These estimates had not included:

- The costs of engine adaptations
- The costs linked to the breakdown of the equipment
- Extra operation and/or maintenance costs like for example urea consumption;

The reason why the two latter cost categories have not been included is that, according to the industry, the SCR systems would not be working in real world conditions anyway, and that they would therefore be switched off.

The IA study had assumed that:

- The SCR would cost 5 500 EUR
- 600 engines are sold per year
- 15% of the market is in the 75-130 kW range (with stage IIIB limits applicable as from 31-12-2011).
- 85% of the market is in the 130-560 kW range (with stage IIIB limits applicable as from 31-12-2012)

At a discount rate of 4%, the NPV of this cost in 2008 is approximately 11 million EUR.

What have we learned from our interviews with the professional end users?

First of all, it is clear that some answers depend significantly on the local conditions:

- Respondent 1 had reported that the successive emission limits had no discernible effect on fuel consumption, while respondent 2 has provided us with concrete figures indicating the contrary.
- Respondent 1 does not think that a major overhaul of the machines is a viable option, while they are current practice for respondent 2. Therefore, the total number of operating hours also differs significantly between the two respondents.

However, the order of magnitude of the initial investment costs (250 to 270 000 EUR), of the annual operating costs (25 to 40 000 EUR) and of the average fuel consumption (22 to 25 litre per hour) is roughly consistent.

Moreover, both users think that the main costs linked to a stage IIIB engine would not be the extra investment in SCR, but the higher equipment breakdown and higher maintenance costs. They also point to the need to invest in the necessary infrastructure for storing urea in a frost free zone, even though SCR would only be a temporary solution before the introduction of EGR technologies.

The operators we have interviewed have suggested therefore that, instead of buying snow groomers that are formally Stage IIIB compliant, they would maintain the existing machines longer.

As indicated above, this will lead to increased operating costs, mainly due to higher maintenance costs.

In the absence of any direct estimates, we need to use reasoned assumptions.

In case study 2, our respondent had answered that he, after an overhaul costing 30 – 40 000 EUR, he was able to operate his snow groomers for 3 to 4 years extra without significant increase in maintenance costs. It is only cost effective to undertake such an overhaul if:

$RV_O - OC > RV_{NO} - \Delta MC$

Where:

RV_O is the resale value on the second hand market of an overhauled snow groomer at the end of its economic lifetime

OC is the investment cost of the overhaul

RV_O is the resale value on the second hand market of a snow groomer which has not been overhauled and which has reached the end of its economic lifetime[46]

Δ MC is the total increase in maintenance cost for snow groomers that have not been overhauled after 6000 working hours

All costs are expressed in net present values at the time of the overhaul.

This condition can be rewritten as follows:

$RV_O - RV_{NO} + \Delta MC > OC$

Our respondents have not been able to provide us with reliable estimates of RV_O and RV_{NO}. In the absence of specific data on the second-value of a snow groomer, we assume that $RV_O = RV_{NO}$.

Under these assumptions, an overhaul will take place if $\Delta MC > OC$

Under these assumptions, 30 000 EUR can be taken as a lower bound to the net present value of the extra maintenance costs that would occur in the absence of such a major overhaul.

Both interviews had also indicated that most operators do not have the technical competence to undertake such an overhaul cost-effectively – for these operators, we shall assume that $\Delta MC = 30\,000$.

Therefore, let us assume that all professional users of snow groomers would maintain their existing stock of snow groomers until EGR technologies become available, and that the net present value of the cost of doing so is 30 000 EUR – this would be approximately 5 times higher than the increase in the purchase cost of a stage IIIB snow groomer with SCR. This reinforces the conclusion reached in the IA study that the compliance costs of option 0 are higher than its expected environmental benefits.

9.5 Conclusion

There are no SMEs involved in the manufacturing of snow groomers. However**, in some Member States, the professional end users** (cableway and ski lift operators) **are all**

[46] Which needs not to be equal to the economic lifetime of an overhauled snow groomers. This does not matter, as all costs are expressed in present value terms.

SMEs. The operators we have interviewed both expect that, if stage IIIB would be introduced according to the existing time schedule, they would avoid as long as possible buying new snow groomers. They expect they could to a large extent cover the transition period to stage IV by **keeping their existing snow groomers** in use beyond their economic lifetime. However, this would come at the price of **increased maintenance and operating costs that are about 5 times as high as the increase in purchasing costs when a snow groomer is equipped with an SCR**.

One of the respondents has pointed out that the **rapid succession of stages** in the NRMM Directive has led to **very small production series**, and to an increase in teething problems during operation. The **impact** of more stringent emission limits on **fuel consumption varies** from end user to end user.

10 Inland waterways

10.1 Introduction

The IA study had already concluded that there are no SMEs involved in the manufacturing of engines. Therefore, engine manufacturers fall outside the scope of the SME test.

However, the markets for engine dealers, shipbuilders and end users are dominated by SMEs. For instance, in most countries, the share of one-vessel companies exceeds 70% of the market.

The current chapter follows the same build-up as the chapter on inland waterways in the impact assessment study. However, the information of the IA study has been complemented with updated statistical data, and with information obtained during our consultation with the sector.

10.2 The Inland Waterways sector

According to Energy and Transport in Figures, Statistical Pocketbook 2009[47], the following Member States have no canals, rivers or lakes that are regularly used for transport: Denmark, Ireland, Cyprus, Malta and Slovenia. The inland waterways of Greece, Spain and Portugal are used by seagoing vessels only.

The Commission is aware of the fact that the quality of data in the field of inland waterways is not harmonised, and that large discrepancies appear between fleet registers of different countries. The lack of concrete statistics has recently been confirmed by EBU[48].

One recent "Market observation for inland navigation in Europe" (2007, p. 5)[49] (henceforth the "Market observation 2007") recognizes that it remains a delicate exercise to reach an exact estimate of the potential European fleet. The "Market observation 2007" included for the first time data on the fleets of most of the Danube States and states in Eastern Europe.

The new regulation on statistics of goods transport by inland waterways (Regulation (EC) No 425/2007) does not directly cover all issues that are relevant for the purposes of this study. 2007 is the first statistical year to which the provisions of this Regulation apply. As will become clear below, there are significant gaps in the Eurostat data.

Therefore, all figures that follow have to be interpreted with a lot of caution.

10.2.1 Size and potential of the market

The following table (Energy and Transport in Figures, Statistical Pocketbook 2007 and 2009[50]) gives an overview of long term evolution of the IWW sector (in 1000 mil tkm)[51]:

[47] http://ec.europa.eu/transport/publications/statistics/doc/2009_energy_transport_figures.pdf.
[48] Personal communication from Mr Tieman (EBU).
[49] http://ec.europa.eu/transport/inland/market_observation_en.htm
[50] http://ec.europa.eu/dgs/energy_transport/figures/pocketbook/2007_en.htm and http://ec.europa.eu/transport/publications/statistics/doc/2009_energy_transport_figures.pdf
[51] We have omitted the countries who have not *reported* on IWW transport in the last ten years from the table. This includes countries (such as Estonia, Latvia and Sweden) whose IWW are in use.

Table 7 Transport volumes in the IWW sector (1970-2006)

	1970	1980	1990	1995	2000	2001	2002	2003	2004	2005	2006	2007
EU27	**112.48**	**119.17**	**118.34**	***122.1***	***133.90***	***131.62***	**131.81**	**123.08**	**136.13**	**138.70**	**138.60**	**141.1**
EU15	**102.63**	**105.89**	**106.98**	**114.60**	**127.38**	**125.94**	**124.91**	**116.41**	**126.07**	**126.22**	**126.74**	**128.4**
EU12	**9.85**	**13.28**	**11.36**	***7.5***	***6.50***	***5.68***	**6.90**	**6.67**	**10.07**	**12.40**	**11.30**	**12.7**
BE	6.73	5.85	5.39	5.73	7.22	7.66	8.07	8.23	8.39	8.57	8.91	9.29
BG	1.83	2.61	1.61	0.53	0.31	0.42	0.56	0.61	0.70	0.76	0.79	1.01
CZ				*0.28*	*0.08*	*0.07*	0.06	0.05	0.05	0.06	0.04	0.04
DE	48.80	51.40	54.80	63.98	66.47	64.82	64.17	58.15	63.67	64.10	63.98	64.72
FR	12.23	10.87	7.58	6.63	9.11	8.29	8.27	8.02	8.42	8.91	9.01	9.21
IT	0.35	0.20	0.12	0.14	0.17	0.16	0.09	0.09	0.11	0.09	*0.08*	*0.09*
LT	0.12	0.15	0.16	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
LU	0.30	0.33	0.36	0.34	0.38	0.37	0.37	0.32	0.37	0.34	0.38	0.35
HU	1.76	2.15	2.04	1.21	0.89	1.09	1.41	1.52	1.90	2.11	1.91	2.21
NL	30.62	33.48	35.66	35.46	41.27	41.79	40.80	39.03	43.09	42.23	42.31	41.87
AT	1.29	1.56	1.66	2.05	2.44	2.56	2.85	2.28	1.75	1.75	1.84	2.60
PL	2.30	2.33	1.03	0.88	1.17	1.26	1.13	0.87	0.37	0.33	0.29	0.28
RO	1.35	2.35	2.09	3.11	2.63	2.75	3.64	3.52	6.96	8.44	8.16	8.19
SK				*1.47*	*1.38*	*0.10*	0.10	0.09	0.09	0.74	0.65	1
FI	2.00	1.80	1.10	0.08	0.12	0.10	0.11	0.11	0.12	0.08	0.07	0.10
UK	0.30	0.40	0.30	0.20	0.21	0.19	0.18	0.18	0.15	0.17	0.16	0.16

This table clearly shows that absolute quantities transported by IWW increase in the long run, albeit at a slow pace (22% over 36 years).

However, the modal share of inland waterways has been decreasing over the last decade, both compared to total transport and compared to inland transport:

Table 8 Modal share of IWW (1995-2006)

Year	Total transport	Inland transport
2006	3.3	5.3
2005	3.4	5.5
2004	3.5	5.6
2003	3.3	5.4
2002	3.6	5.9
2001	3.6	6.0

2000	3.8	6.1
1999	3.7	6.0
1998	3.9	6.3
1997	3.9	6.3
1996	3.8	6.1
1995	3.9	6.3

This low average hides important regional variations: the modal share of IWW can reach 43% in the hinterland of the largest seaports[52].

The most recent "Market observation for inland navigation in Europe" (2008, p 6)[53] (henceforth the "Market observation 2008") also observed that, while other hinterland transport infrastructures are running close to full capacity in and around seaports across Europe, waterways have still potential for future growth. However, it is also admitted that barge transport has to become an integral part of the logistics chain. Its main disadvantage is that it is not as fast and flexible as road or rail, but is cheaper per cargo unit. Therefore, its competitive advantage lies mainly in the transport of large volumes of good which are not too time-sensitive.

10.2.2 Engine dealers

Taking into account the very large share of The Netherlands in the total market[54], we have focused our work on the Dutch situation.

A survey of the Dutch association of engine dealers VIV has shown that, in 2008, just 14% of its members had sales exceeding the 50 million EUR[55]. This suggests that a significant share of engines dealers is indeed composed of SMEs.

VIV has also conducted a survey amongst its members for the purposes of the current study. Out of the respondents to this survey, 32% are medium enterprises, 50% are small enterprises and 18% are micro-enterprises. They represent a total employment of 1499 full time equivalents. Average employment in these companies is 68 FTE. 30% of the respondents sell engines for IWW applications. These engines correspond to 45% of their sales, 51% of their direct employment, and 28 of indirect employment.

10.2.3 Shipbuilding companies: market situation

Taking into account the very large share of The Netherlands in the total market[56], we have focused our work on the Dutch situation.

The Holland Shipbuilding Association (HSA) represents 20 companies involved in the full construction[57] or completion of inland navigation vessels. Of these companies, 17 fall within the definition of medium-sized companies and 3 are small companies. The Association estimates that, including equipment suppliers and subcontractors, the total workforce employed by these companies is around 1 200 employees.

[52] http://ec.europa.eu/transport/iw/index_en.htm
[53] This document can be downloaded free of charge from http://www.ccr-zkr.org/ .
[54] Personal communication by Euromot.
[55] VIV Branche Barometer 2009.
[56] According to recent statistics of the CCNR, 90% of inland waterway vessels supplied to CCNR countries have been supplied by Dutch companies.
[57] Full construction means that one single company builds the body of the ship and equips the ship (with engines, hydraulic systems, electrical and electronic equipment, etc).

Table 9: Employment by members of the HSA

Vessel type	direct employment (FTE)	indirect employment (FTE)
Dry cargo + containers	100	165
Inland tanker	230	455
River cruise vessel	70	160
Other types	40	20

Table 10: Sales by members of the HSA

Vessel type	Sales outside the EU	Sales in the EU
Dry cargo + containers		100%
Inland tanker		100%
River cruise vessel	20%	80%
Other types	5%	95%

The Association estimates that another 20 companies are involved in the completion only of inland vessels[58]. These are mainly small companies. The Association estimates that the total workforce employed by these companies corresponds to another 600 employees.

All the exports outside the EU are to countries (such as Switzerland) that comply with the emissions limits of the NRMM Directive.

As all companies involved in shipbuilding are SMEs, size does not appear to be as strong advantage in this market. The HSA reckons that SMEs have a clear competitive advantage because they are flexible and know their clients well.

10.2.4 Fleet size and composition

According to recent figures used by the European Commission (SEC(2006) 34/3), the sector is currently composed of some 12,500 motorised units; about 95% of which are registered in The Netherlands, Germany, Belgium or France. The Dutch fleet represents about 50% of the European Union's fleet. SEC(2006) 34/3 estimates the number of self-propelled dry cargo vessels at 7100 units and the number of self-propelled tanker vessels at 1400 units (the remaining number being made up by either tugs or push boats).

The "Market observation 2008" provides the following recent figures:

Table 11: Number of units

	2005	2006	2007
Self propelled dry cargo barges	6111	6427	6559
Ordinary barges	3131	3891	4053
Self propelled tanker barges	1374	1423	1468

[58] Completion only means that dealers or inland waterway companies order ship bodies abroad and that a Dutch shipbuilder completes the work.

Tanker barges	199	187	183
Tugs	716	751	411
Pusher tugs	1349	1444	1440

For 2007, this yields a total of 9878 *motorised* units, which is slightly less than the estimate of SEC(2006) 34/3.

According to the "Market observation 2008", the Dutch share in 2007 equalled 37% of the dry cargo fleet, 48% of the tanker fleet and 50% of the tug boat fleet. The fleets registered in The Netherlands, Germany, Belgium and France totalled 78% of the dry cargo fleet, 92% of the tanker fleet and 81% of the tug boat fleet.

The figures in the "Market observation 2008" are thus approximately in line with those reported in SEC(2006) 34/3.

10.2.5 Fleet age and renewal

The average age of a self-propelled European dry bulk ships is 37 years whereas tanker ships have an average age of 31 years (SEC(2006) 34/3). During the past 15 years, the fleet has modernised continuously[59].

Unfortunately, detailed EUROSTAT data on the age structure of the fleet are not available for most countries.

For the countries covered by the "Market observation 2008"[60], the age structure is summarized in Table 12 and Table 13.

Table 12: Age structure according to the number of units

	Dry cargo fleet	Tanker fleet	Tugs and pusher tugs
Before 1930	8.99%	2.06%	13.34%
1930-1949	6.26%	2.67%	16.53%
1950-1959	16.79%	15.58%	15.18%
1960-1969	22.44%	22.12%	18.31%
1970-1979	12.53%	21.64%	15.83%
1980-1989	19.37%	10.12%	16.32%
1990-1999	6.22%	9.94%	2.59%
2000-2006	5.52%	13.45%	0.65%
not known	1.88%	2.42%	1.24%

Table 13: Age structure according to tonnage

	Dry cargo fleet	Tanker fleet
Before 1930	5.95%	0.28%
1930-1949	4.25%	0.75%
1950-1959	11.26%	8.89%
1960-1969	16.11%	11.45%
1970-1979	14.72%	23.94%
1980-1989	23.72%	13.29%
1990-1999	10.60%	12.81%
2000-2006	11.35%	25.71%
not known	2.04%	2.88%

[59] http://ec.europa.eu/transport/iw/index_en.htm
[60] DE, AT, BE, FR, LU, NL, CH,PL, CS, SK, HU, RO and BG.

It is clear that the relatively small number of vessels built after 1990 (11.74% of the dry cargo fleet and 23.39% of the tanker fleet) represent a proportionally much larger tonnage (21.95% of the dry cargo fleet and 38.52% of the tanker fleet). This shows the need to evaluate both the number of units and the tonnage per age category: the average capacity of new ships is clearly significantly larger than the average capacity of older ships.

One possible explanation for this continuing use of old ships is that, while these older ships have been completely amortized, their operating costs are not necessarily much higher than the operating costs of new ships. For instance, stage 2 engines consume more fuel than stage 0 engines[61].

Moreover, some countries (such as France and Poland) have a disproportional number of old vessels. Indeed, because the inland waterways in these countries are narrower, they have to use smaller ships. However, because small ships use the same equipment as large ships, they need to navigate longer before the fixed costs are amortized. In Belgium and The Netherlands, the age structure of the fleet is much younger. The important number of new engines put on the market in The Netherlands in the recent past is mainly due to a large number of new ships that were put on the market. [62]

According to the "Market observation 2007" (p.37)[63], the number of vessels being scrapped is very limited, but the authors also admit that there is no means of checking this.

The "Market observation 2008" (p 55)[64] concluded that over the past 8 years there has been a drop of nearly 30% in self-propelled barges with a capacity of *less than 1000 tonnes*. Many of these units are now used as accommodation, or have been sold to other States. New construction in this segment is very small. However, small units remain necessary for navigation on secondary waterways (Belgium, northern France, eastern Germany, Poland and the Czech Republic). The withdrawal of small units can thus lead to bottlenecks in some niches. However, the average number of large units (mainly operated on the Rhine) remains stable.

For indicative purposes, in the period 2002-2007, 565 vessels were built[65], corresponding to a capacity of 1,392,906 tonnes and 445,041 kW. This figure does not include 9 tugs (14394 kW) and 62 passenger boats (49,500 kW).

According to the "Market observation 2008" (p. 55, p 60), 74 new self-propelled barges (with an average capacity of more than 3000 tonnes) and 31 barges (with an average capacity of 2800 tonnes) have been put into circulation in 2007 – this is almost double the figure of 2006. These are almost all large units that can operate around the clock. Moreover, 31 tanker vessels (with an average capacity of 2500 tonnes) were put in operation in 2007 – this increase is 20% less than the increase in 2006.

At the time the "Market observation 2008" was published, the pace of putting new capacity on the market appeared to remain the same as in 2007. However, a number of orders for vessels had already been cancelled by then. Personal communication with EBU has confirmed that the situation has changed dramatically since the publication of

[61] Personal communication from Mr Tieman (EBU).
[62] Personal communication from Mr Tieman (EBU).
[63] http://ec.europa.eu/transport/inland/market_observation_en.htm
[64] This document can be downloaded free of charge from http://www.ccr-zkr.org/ .
[65] This is an average of 113 per year. The order of magnitude of this figure is comparable with the figure provided by the engine industry.

the last official statistics (see Section 10.4). Recent figures suggest that 130 new ships were put in circulation in 2008 and 79 new ships in the first 6 months of 2009[66].

The sector expects that the number of ships will decrease further, but that the average size of ships will increase (BVB1, p.38).

10.2.6 Organisation of the market

In general, Inland Waterway Transport (IWT) can be divided into two types of ownership (Jonkeren 2005):

- Owner operators: this is transport of goods against payment by another company than the company that produces or uses the goods. Owner operators are one-ship enterprises or shipping companies. Most IWT operators fall in this category. In general, one-ship IWT enterprises have limited market power.
- Own account transporters: haulage of goods with inland waterway ships only destined for or originating from the own company.

Large ship owners operate mostly for large clients. Due to their size, they can own several types of ships, and, when needed, subcontract to smaller ship owners[67].

The share of one-vessel enterprises exceeds 70% in most countries (see SEC(2006) 34/3). In the Netherlands, up to 90% of the IWT enterprises are one-vessel companies (BVB2, p 43).

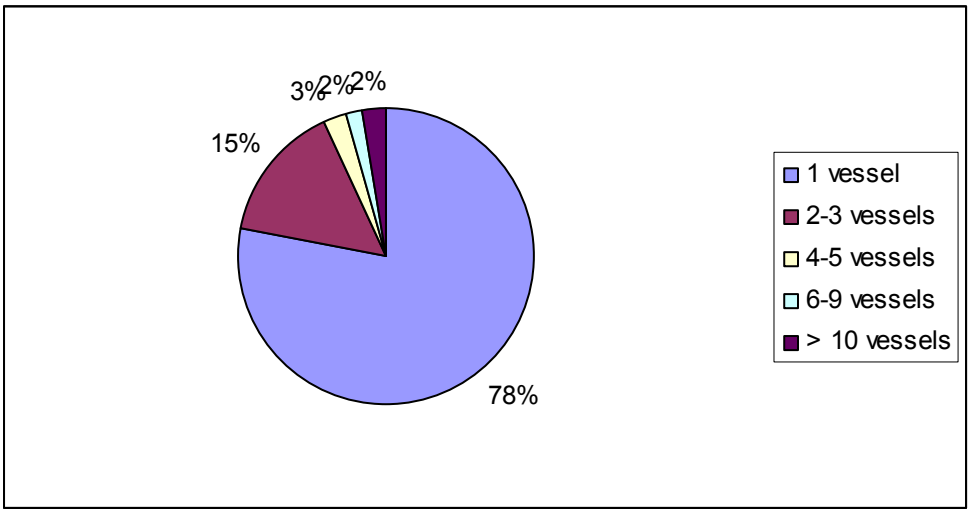

Figure 1: Number of IWT enterprises by number of vessels in 2005 (EUROSTAT)

Figure 1 gives the number of IWT enterprises by number of vessels in 2005, according to EUROSTAT. It has to be kept in mind that the dataset covers only data for the following countries: BE, BG, CZ, FR, LT, PL, SK, FI, UK and HR. In the absence of data on Germany and the Netherlands, the figures are meant to be indicative only. However, for the countries that are reported by EUROSTAT, the number of one-vessel companies exceeds the 78%. Less than 2% of the companies own more than 10 vessels.

According to Dutch figures, 87% of enterprises are one-vessel-companies. Just 9 enterprises (5%) have 20 or more vessels[68].

[66] Personal communication from the Holland Shipbuilding Association.
[67] Personal communication from Mr Tieman (EBU).
[68] BVB (Dutch Inland Shipping Information Agency) in cooperation with the Expertise and Innovation centre Inland Shipping (EICB) and EBU, The future of freight transport and inland shipping in Europe. 2010-2011.

EUROSTAT also provides data on employment in IWT enterprises by the number of vessels in the enterprises. However, data are limited to CZ, LV, LT, LU, PL, RO, SK and HR. We do not think such a sample is meaningful for the purposes of this study.

EBU reckons that most of its members are micro enterprises. There are very few ship owners that would qualify as "medium sized companies" (their turnover may exceed the threshold but they generally employ less than 250 people). In Germany, some ship owners own up to 130 ships. However, in the Netherlands, the number of ship owning companies has decreased and the number of independent owners increased in recent years. This was due to two factors:

- it was easy to obtain credit from the banks[69].
- the way the Dutch tax regime affected the benefits resulting from ship sales[70]

Following the current financial crisis (see Section 10.4) EBU expects a new consolidation round where ships from bankrupt independent owners are bought by the large ship owning companies.

In general, IWT companies are considered to have a relatively weak bargaining position compared to their clients. This is due to both structural and temporary factors:

- In general, the cost of IWT is only a small fraction of total costs for the clients (1 to 2%). Therefore, demand is not very sensitive to price.
- The current overcapacity problem has further increased the negotiating power of shippers. Prices are also depressed because of the continued used of old ships[71].

For the transport of dry bulk, both spot markets and long term contracts are used. Tankers mostly used long term contracts.

There are few barriers to entry in the sector (Jonkeren 2005).

We can conclude that **the IWT sector is mostly composed of very small SMEs that are subject to a high level of competition.**

10.2.7 Cost structure

The cost structure of IWT varies a lot from ship to ship. To cite just three examples:

According to Jonkeren, for a dry cargo ship, the main cost drivers are (expressed as percentage of annual turnover): fuel (20%), personnel (20%), interest and depreciation (25%) and maintenance (10%). However, energy prices have fluctuated substantially since this study was published.

According to the European Commission[72], the share of labour within total costs can be as high as 57%, especially for smaller ships.

According to a recent Dutch study[73], in the case of a dry load vessel in continuous deployment, labour represent 33% of total costs, capital 17% and fuel 44%.

This broad range of estimates is due to several factors:

[69] In the current market circumstances, this is of course no longer true – see further.
[70] Buck Consultants et al. (2004), Prospects of inland navigation within the enlarged Europe (PINE)
[71] Personal communication from Mr Tieman (EBU).
[72] Commission staff working document - Annex to the Communication from the Commission on the promotion of inland waterway transport "NAIADES" - An Integrated European Action Programme for Inland Waterway Transport (COM(2006) 6 final).
[73] BVB (Dutch Inland Shipping Information Agency) in cooperation with the Expertise and Innovation centre Inland Shipping (EICB) and EBU, The future of freight transport and inland shipping in Europe. 2010-2011.

The price of ships varies significantly across categories. A new ship could cost 2 million EUR. However, in some extreme cases, the cost of a barge could be close to 6 million EUR.

Personnel needs depend also on the ship category. In Belgium, for instance, a lot of IWT companies are family business, with at the most one employee (sailor). However, on a barge, up to 6 workers are needed, and labour cost can indeed correspond to up of 50% of the total cost structure[74].

The cost of engines can also vary from 450 000 EUR (for single screw vessels) to 900 000 EUR (for double screw vessels)[75].

As the average size of new ships that are put in the market is increasing, the average workforce per ships is also increasing. Moreover, due to the higher capital costs, these ships need to be operated on a continuous basis, which also leads to an increase in the demand for personnel[76]. However, this tendency in itself does not say anything on how personnel costs will evolve compared to capital costs.

10.2.8 The position of SMEs - miscellaneous

In order to understand the competitive position of SMEs vis-à-vis large companies, the following elements are also important[77]:

- Understanding regulations can be a problem for SMEs. However, they rely on their professional associations for advice. Compliance with the NRMM Directive is however purely an issue for the engine suppliers. Therefore, the NRMM Directive does not lead to a competitive disadvantage for SMEs from this specific perspective.
- There is very little R&D going on it the IWW sector. The ship hulls are still essentially the same as 30 years ago. Therefore, high fixed R&D costs do not constitute a competitive disadvantage for SMEs.
- Niche markets (such as tankers) that need a lot of expertise are usually in the hands of the large ship owners.
- One important advantage for the smaller companies is that they usually can recruit cheaper labour (temporary workers) while the large companies are subject to collective labour agreements. (It should be noted that, until the financial crisis, one of the most important concerns of the sector was the lack of qualified personnel – 30% of the workforce on board of IWW vessels have a different nationality as their employer. Offering a permanent contract can then be a competitive advantage for attracting qualified personnel. This “war for talent” is confirmed by a relatively high mobility of labour *within* the sector)[78].
- It is possible for large ship owners to obtain discounts when they purchase a large quantity of engines. However, engine suppliers do not price discriminate between small and large clients for individual orders.

The European Commission has also pointed to the problems SMEs face regarding access to capital. The Commission has therefore envisaged the study (together with the

[74] Personal communication from Mr Tieman (EBU).
[75] Personal communication from the HSA.
[76] Van der Aa et al. (2008), Monitor Maritiem Arbeidsmarkt 2008, in opdracht van Ministerie van Verkeer en Waterstaat, in samenwerking met Stichting Nederland Maritiem Land, uitgevoerd door ECORYS.
[77] Personal communication from Mr Tieman (EBU).
[78] Van der Aa et al. (2008), Monitor Maritiem Arbeidsmarkt 2008, in opdracht van Ministerie van Verkeer en Waterstaat, in samenwerking met Stichting Nederland Maritiem Land, uitgevoerd door ECORYS.

European Investment Bank) of specific windows to be made available to IWT enterprises – see Section 10.3.

10.3 Policy context

The European policy to promote inland waterways transport has been framed in the NAIADES Action Programme, adopted in January 2006 and running until 2013.

NAIADES sets the frame for a comprehensive inland waterway transport policy by focusing on five strategic interdependent areas:

- Improving market conditions
- Modernising the fleets
- Developing the human capital
- Strengthening the image
- Amending the infrastructure

As a general point, it is important to mention that the Commission has taken a favourable position on targeted financial incentives for modernising the fleet and fostering personal resources (see SEC(2006) 34/3).

For the purposes of this study, the following points are worth mentioning (COM(2007) 770 final):

- The Commission has carried out an ex ante evaluation and impact assessment of a European Inland Waterway Transport Innovation Fund. However, the idea did not materialise as the consultations with the representative organisations of the inland waterway transport sector and Member States showed that there was finally no agreement regarding the financing of the fund[79].
- An Inland Waterway Transport Funding Handbook has been published, containing an inventory of European, national and regional aid schemes[80].
- As the *de minimis* rule regarding the application of the EC states aids also applies to the transport sector, state aid may be granted to any one undertaking up to 200,000 EUR over a period of three years without further authorisation at the EU level[81].
- A screening of administrative and regulatory barriers has taken place and has resulted in a report that was published in September 2008[82]. This report refers, amongst others, to the issues raised by the NRMM Directive. It suggests to look at the possibility to agree upon broader based (e.g. worldwide) standards. The discussion in that report does not contain fundamentally new elements compared to the discussion here.
- The Community contributes to the provision of an adequate infrastructure through programmes such as the Trans-European Networks.
- In some member States, the modernisation of the fleet is encouraged through tax-free reinvestment schemes, and financial aid for the improvement of the economic and environmental performance of vessels.

[79] DG TREN, personal communication.
[80] http://www.naiades.info/page.php?id=100&path=95 .
[81] This needs to be compared with the initial investment cost linked to stage IV of 450.000 EUR (CCNR proposal) and of 5.000 for the EUROMOT proposal.
[82] NEA, "Study on Administrative and Regulatory Barriers in the field of Inland Waterway Transport" http://www.naiades.info/page.php?id=100&path=95 .

- State aid guidelines for inland waterways have been announced since January 2006. However, the Commission refrained from presenting such guidelines until now, because several Member States had adopted state aid schemes before not so long[83].
- Inland waterway project can also obtain support from Marco Polo, the European Union's funding programme for projects which shift freight transport from the road to sea, rail and inland waterways.
- On 1 October 2008, the European Commission launched the PLATINA project in a bid to further boost the promotion of inland waterway transport by providing an effective platform to support the implementation of NAIADES. The project, which brings together 22 partners from 9 European countries, has received funding of € 8.5 million from the Commission under the 7th Framework Programme for Research and Technological Development. Planned actions include the setting up a single portal for online inland navigation information services and an inland navigation education network, as well as the provision of technical support for the further development of River Information Services (RIS).

Conclusion: although the regulated market segments in IWT have been abolished, actual costs remain heavily influenced by public support schemes, many of which are left (within limits) to the discretion of the Member States.

10.4 Impact of the financial crisis

The most recent "Market observation for inland navigation in Europe" (2008)[84] does not include yet the most recent developments related to the financial crisis. The foreword to this publication emphasized that the impacts of the financial crisis are surrounded by uncertainty with respect to their scale and duration, and that the changes that may be observed on the basis of the statistics for 2007 bear no relation to those that may occur in 2008 and even less to those occurring in 2009.

As the demand for inland waterway transport is essentially a derived demand[85], and as the recession strikes particularly hard in the industrial sector, it is reasonable to expect that the IWT sector will be disproportionally hard hit by the recession. The IWT will also be affected by a decrease in the demand for cruises.

According to recent estimates, freight volumes in IWT have dropped with 50% since the beginning of the financial crisis. For some ships, even variable costs are no longer covered by the freight rates, and it is cheaper for them to stay at berth[86].

A precise estimate of the impact of the economic downturn on IWT is currently not possible because most transport statistics have a processing time of more than a year[87].

According to EBU, a capacity reduction is inevitable because too many ships have been brought on the market in the recent years. EBU expects that the number of new engines put on the market will decrease rapidly. Currently, a lot of orders are cancelled despite the financial penalties linked to these cancellations.

The Holland Shipbuilding Association has provided us with the following assessment of the market:

[83] DG TREN, personal communication.
[84] This document can be downloaded free of charge from http://www.ccr-zkr.org/ .
[85] 75% of the volumes transported by IWT are related to industry demand. The remaining 25% corresponds to the agricultural sector and oil products.
[86] Personal communication from Mr Tieman (EBU).
[87] BVB (Dutch Inland Shipping Information Agency) in cooperation with the Expertise and Innovation centre Inland Shipping (EICB) and EBU, The future of freight transport and inland shipping in Europe. 2010-2011.

Table 14: Assessment of the inland waterway vessel market by the HSA

Vessel type	General assessment of the market
Dry cargo + containers	The number of completed vessels will drop dramatically and come to an almost complete standstill by the end of 2010, which will last at least 2 years. There are several dozens of ships in the order books but it is estimated that about 25% of the hulls yet to be delivered will not be completed until the market has improved.
Inland tanker	During 2010 the number of completed vessels will slow down considerably, but it is expected that the market will pick up again after a period of reluctance, which might last 0,5 – 1 year. Due to fleet renewal (double hull requirements) there will remain a continuous demand to replace existing single hull tankers.
River cruise vessel	This small niche market seems to have been little affected by the economic crisis, though ship owners waited a long time before deciding about new orders. Eventually these were placed by the end of 2009.
Other types	No general assessment possible.

However, because the situation can change quickly in the opposite direction as well, EBU thinks that the long term assumptions used in the IA study can be maintained.[88]

Another impact of the financial crisis is that, due to the credit crunch, access to the capital markets has become a significant problem. Large ship owners buy new ships with equity capital because loans are too expensive. Independent owners still need to rely on banks[89].

In order to put these issues in perspective, we need to keep in mind that the emission limits for stage IIIB would only apply as from 2012. The most recent Economic Forecast of the European Commission[90] expects that GDP will broadly stabilise in all of the larger economies of the EU in 2010, except Spain where a further contraction of close to 1% is predicted. Reflecting the usual lag between changes in employment and output, employment is expected to contract by a further 1½% in 2010.

However, the sector itself is confident that, after the recession, goods transport will catch up with extra growth during 1.5 years[91].

10.5 Mitigating measures

10.5.1 Suggestions by the sector

According to the most recent "Market observation for inland navigation in Europe" (2008)[92], the following measures would be important to increase the share of barge transports:

- Fast and reliable treatment of barge ships in the seaport (for instance through dedicated barge terminals)
- Infrastructure investment in key bottlenecks (such as locks and bridges) to reduce waiting times and/or increase the permissible ship size

[88] Personal communication from Mr Tieman (EBU).
[89] Personal communication from Mr Tieman (EBU).
[90] http://ec.europa.eu/economy_finance/publications/publication15048_en.pdf
[91] BVB (Dutch Inland Shipping Information Agency) in cooperation with the Expertise and Innovation centre Inland Shipping (EICB) and EBU, The future of freight transport and inland shipping in Europe. 2010-2011.
[92] This document can be downloaded free of charge from http://www.ccr-zkr.org/ .

- Increasing the relative cost advantage of barge transport via the reduction of fees or financial incentives for the use of CO_2 efficient barge transport
- Transfer of distribution activities to inland hub terminals through the bundling of container traffic flows

Whilst none of these measures are related directly to the NRMM Directive, they do point to two important issues:

- Whilst regulations may impose compliance costs on some sectors, it could well be that the highest potential for cost reductions lies in completely unrelated fields;
- The NRMM Directive only covers polluting emissions, and does not take into account other environmental dimensions (such as the emissions of greenhouse gasses).

Concerning the NRMM Directive, the EBU has expressed the following opinions[93]:

- EBU would like to see the NRMM Directive coupled with CO_2 performance. In The Netherlands, for instance, subsidies exist for fuel efficient engines.
- EBU would like to see harmonisation between the EPA regulations and the EU.
- EBU would also like to see clarifications on how the Directive deals with dual fuel engines. How will it be verified whether the ship operates on diesel or on a mixture of gas and diesel?
- EBU thinks that the CCNR proposal for the next stages in the NRMM Directive is too expensive and that it would be more cost efficient to reduce emissions from IWW through cold ironing[94].

During a round table meeting with the Dutch engine dealers association, the following issues were raised[95]:

- According to some dealers, their engine suppliers outside the EU find it difficult to understand why specific emission standards should exist for the relatively small European market. Others have confirmed that the main concern expressed by manufacturers is not the stringency of the standards as such, but the lack of international harmonisation in this field. The possibility to regulate emissions of all vessels at the IMO level would be a possibility, but it has been acknowledged that many member states of the IMO would not be interested in this issue, and that the resulting emission standards may end up being too lax.
- The dealers confirm that none of the manufacturers they work with expect to be able to meet the CCNR standards for stage IV. They assert that, due to existing standards, some power ranges are no longer supplied and that some vessels are being equipped with engines that are too large for their needs. One engine dealer claims that fuel consumption has increased with 5% since the introduction of CCNR2. Until this date, we have identified no independent sources that confirm this claim.
- The testing of engines for type approval takes place with EN590 diesel fuel. However, in operational conditions, other fuel types are supplied. Although these fuels have to comply with the provisions of Directive 2009/30/EC, the scope of the Directive is limited to sulphur. The actual HC, NOx, CO and PM emissions of other fuel types are not well known, and it is not clear to what extent the real-life emissions of an engine correspond to the emissions measured during the testing.

[93] Personal communication from Mr Tieman (EBU).
[94] This means, the supply of electricity from on-shore resources whilst at berth (instead producing electricity with on-board generators).
[95] The minutes of this meeting still not formal approval.

- The NRMM Directive only covers NOx, PM, HC and CO. However, some of the measures taken to reduce NOx consumption can lead to increased CO2 emissions.

10.5.2 The benefits of accelerated engine replacement

In the light of these comments, we think it essential to point out that the environmental impact of more stringent emission limits for the IWT sector will be very slow to materialise. Indeed, the emission limits of the NRMM Directive only apply to *new* engines. In a sector with a very low replacement rate[96], the emissions of old engines (CCNR stage I or older) will dominate all other effects for a long time.

We think it is therefore worthwhile to compare the environmental benefits of:

- choosing the CCNR proposal rather than the Euromot proposal for stage IIIB and IV versus
- accelerating the replacement of old engines by engines complying with the emission limits of the Euromot proposal.

It is important to point out right away that an exhaustive analysis of this question is not possible:

- The actual distribution of engines in use according to their emission characteristics, maximum power and usage parameters is not well known;
- The existing CCNR emission limits are defined in terms of engine power, not swept volumes;
- We do not know the environmental impacts linked to the production process of engines destined for IWW applications.

Therefore, we use a simplified analysis for illustrative purposes.

We will calculate the monetary value of the annual air quality benefits of:

- Equipping a “typical” ship with a CCNR stage IV engine rather than a Euromot stage IV engine
- Replacing an existing CCNR1 or CCNR2 engine on a “typical” ship with a Euromot stage IV engine.

We limit the analysis of environmental impacts to air pollution during operation, and we abstract from environmental impacts of producing new engines and scrapping old engines.

We maintain the assumption used in the IA study that a “typical” ship has a 1400 kW engine. We can then apply the existing CCNR1 and CCNR2 emission limits for engines of this power category on the one hand, and the proposed stage IV emission limits on the other hand.

Table 15: CCNR1, CCNR2 and stage IV emission limits for 1400 kW ships

	CCNR1	CCNR2	Stage IV CCNR	Stage IV Euromot
PM	0.54	0.2	0.025	0.04
NO_x	9.2	6	0.4	1.8
HC	1.3	1	0.19	0.19

[96] In the IA study, we had estimated that it would take 25 years before the number of stage IV engines would stabilise.

We also maintain the assumption used in the IA study that such a ship operates for 3000 hours a year with a load factor of 0.55.

We also use the following unit values for environmental damage costs (expressed as EUR per tonne:

NO_x	PM	HC
5155	30625	1171

This then yields the following estimates:

Table 16: Differences between Euromot and CCNR proposal for stage IV

	g/kWh	tonnes per ship per year	EUR of external costs of air pollution per ship per year
PM	0.015	0.03465	1,061
NO_x	1.4	3.234	16,671
HC	0	0	0
Total			17,732

Table 17: Differences between CCNR1 and Euromot proposal for stage IV

	g/kWh	tonnes per ship per year	EUR of external costs of air pollution per ship per year
PM	0.5	1.155	35,372
NO_x	7.4	17.094	88,120
HC	1.11	2.5641	3,003
Total			126,494

Table 18: Differences between CCNR2 and Euromot proposal for stage IV

	g/kWh	tonnes per ship per year	EUR of external costs of air pollution per ship per year
PM	0.16	0.3696	11,319

NO_x	4.2	9.702	50,014
HC	0.81	1.8711	2,191
Total			63,524

These figures suggest that the annual environmental benefits of replacing a CCNR1 engine with a Euromot stage IV engines are almost an order of magnitude larger than the annual environmental benefits of using a CCNR stage IV engine rather than a Euromot stage IV engine. In the case of a CCNR2 engine, these annual benefits are still more than three times as large.

The actual environmental benefits are likely to be different, for at least two reasons:

- We have abstracted from the environmental costs linked to production and scrapping.
- There is an unknown number of engines in use that do not even comply with CCNR1.

Moreover, it is not clear to what extent this result can be extrapolated to other classes (defined in terms of engine power or swept volume).

Nevertheless, we think that these figures indicate that significant environmental benefits could be obtained from accelerating the replacement of old engines, at a cost which would be lower than the cost of complying with the CCNR stage IV proposal.

10.5.3 The issue of greenhouse gas emissions

The requests of the sector to consider CO_2 emissions as well is understandable in the light of its relatively high energy efficiency on the one hand, and the impact of some NO_x abatement techniques on fuel consumption on the other hand.

However, if future legislation would also take into account CO_2 emissions, then consistency would require to also take into account the impact on other greenhouse gasses, such as black carbon and tropospheric ozone[97], which are linked to PM and NO_x emissions.

10.5.4 Cold ironing

It could be worthwhile investigating the environmental effects of cold ironing compared to more stringent emission limits. In a Dutch test project with cold ironing, NO_x emissions were reduced at a cost of 13.9 EUR per kg.

Let us compare this with the marginal cost of reducing NO_x up to the limits implied by the CCNR proposal.

According to Table 16, a CCNR stage IV ship would emit 3.234 tonnes of NOx less than a Euromot stage IV ship. In the IA study, we had assumed that an engine could be used for 12 years before an overhaul.

We had assumed the following compliance costs for stage IV:

	CCNR	Euromot
Investment cost	450 000	5 000
Annual depreciation	37 500	417

[97] These are admittedly not covered by the Kyoto Protocol.

User and maintenance costs	40 000	30 000
Total annual costs	77 500	30 417

Thus, the annual difference in compliance costs between the CCNR and the Euromot proposal for stage IV is 47 083 EUR per ship. This means that the marginal abatement cost of the CCNR proposal compared to the Euromot proposal is 47 083/3.234 = 14 559 EUR. This is three orders of magnitude larger than the cost of reducing NOx with cold ironing.

Of course, one should avoid drawing too strong conclusions from these figures: the potential of cold ironing as an abatement technique faces a natural upper bound (a vessel's electricity consumption while at berth), and cold ironing cannot contribute to the reduction of emissions during navigation. Nevertheless, these figures do suggest that cold ironing has potential as a low cost emission reduction strategy.

10.6 Conclusion

In the IWT sector, all markets downstream of the engine manufacturers (dealers, shipbuilders, ship-owners) are clearly dominated by very small enterprises. This in itself demonstrates that in **this sector, size of the enterprise is**, except in a few specific cases, **not a real competitive advantage**.

This should of course not distract us from the fact that the current economic downturn can have a dramatic impact on individual enterprises and will probably result in a (re)consolidation of the sector. However, the sector itself has indicated that it expects that the recession will be followed by an important catching up. It is therefore likely that the first engines complying with the stage IIIB standards will be put on the market after the end of the downturn. By that time, access to capital should have improved as well.

We have argued above that very little can be said in general terms about the cost structure of IWT enterprises. The initial investment costs linked to stage IV of the CCNR have been estimated at 450 000 EUR, which is high, even compared to the purchase cost of a barge (see Section 10.2.7). However, as about half of this sum could be subsidised without exceeding the *de minimis* limits for state aid, it is **not impossible that**, in practice, **the burden of compliance costs will effectively be shared between taxpayers and the IWT sector.**

Independently of the issues related to the SMEs, we think we also need to point to the following issues:

- Because the **NRMM** only applies to new engines, it effectively increases the cost of replacing old engines by new ones. This **can lead to a postponement of the decision to replace these old engines**. This possibility does of course not imply that the currently proposed limits are so stringent that the negative indirect effects compensate the positive direct effects of stringent emission limits (note that the IA study had shown that the negative indirect effect on modal split is negligible).
- We have performed some calculations that indicate that **significant environmental benefits could be obtained from accelerating the replacement of old engines**, at a cost which would be lower than the cost of complying with the CCNR stage IV proposal. This suggests that other instruments on top of the NRMM Directive (such as

incentives to scrap old engines) could reinforce the positive direct effects. However, **the net effect also depends on the environmental impacts of engine production and scrapping**, which have not been calculated here.

- **Cold ironing** has potential as a cost-effective emission reduction strategy for ships at berth. However, a more in-depth evaluation of cold ironing should start with a more detailed emission inventory.
- If future legislation would also take into account CO2 emissions, then consistency would require to also take into account **the impact on other greenhouse gasses**, such as black carbon and tropospheric ozone, which are linked to PM and NOx emissions.
- The testing of engines for type approval takes place with EN590 diesel fuel. However, in operational conditions, other fuel types are supplied. The actual HC, NO_x, CO and PM emissions of other fuel types are not well known, and **it is not clear to what extent the real-life emissions of an engine correspond to the emissions measured during the testing**.

11 Locomotives and rail cars

The IA study had concluded that no SMEs are involved in the manufacturing of engines and locomotives.

However, small freight operators do fall within the definition of SMEs.

The questionnaire has therefore been submitted to the European Rail Freight Association, the association of new operators to the rail freight market across Europe, mostly private and independent companies.

ERFA has responded that the members of ERFA (which are all SMEs) see a problem with increasing costs charged by the leasing companies if stage IIIB was applied by 1st Jan 2012. According to ERFA, leasing is becoming more and more a normal practice and the leasing rates are already quite high.

We have requested ERFA to provide us with more concrete information on this subject, but nothing has been provided.

12 General conclusion

12.1 The number of SMEs identified in the course of the study

The most striking conclusion of this study is that, despite the very important efforts undertaken by the project team and abstracting from the shipbuilders, **less than 10 individual OEMs have been identified unequivocally as SMEs** and have contributed actively by responding to the questionnaire (or by participating in round table meetings). This is surprising, taking into account that in the process of the IA study, several sectors have also reported high numbers of SMEs amongst their members.

The **number of SMEs identified amongst professional end users was much higher**, but really new information was only provided by the following sectors: independent winegrowers, cableway and ski lift operators, and by the inland waterways sectors.

We think that there are several explanations to this result, which we will discuss in turn before drawing policy conclusions.

12.1.1 Discrepancy between EC definition and public perception

A first important factor is that the **EC definition is actually very restrictive**, and is not well known. When it is asked informally to estimate the number of SMEs in a given sector, the natural tendency is to look at the figures related to employment, turnover and balance sheet total, and to overlook the criteria related to linked and partner enterprises. In the case of Eurostat data, the criteria are even limited to the number of persons employed.

However, once the EC criteria were stated explicitly some sector organisations have informed us quickly that the number of SMEs amongst their members is extremely limited. This can explain why the response rate was so low, despite the fact that the sector organisations have immediately been involved in the study.

12.1.2 Low SME membership of sector federations

As an alternative explanation, it has been suggested that SMEs feel that their specific interests are not always well represented by the sector federations. Therefore, the low response rate may rather be due to the **composition of the membership of the sector federations**, and not to the number of SMEs as such. In order to deal with this specific issue, we have also used the UEAPME as an alternative communication channels, but this has not resulted in any response.

Finally, we have also, where possible, used alternative sources of information (such as business directories) to identify SMEs *directly*. Whenever information in the public domain suggested that these companies could fulfil the criteria, they have been contacted individually. Except in the very specific case of high clearance tractors, the results have been very meagre[98].

In the absence of individual responses explaining why a company has not participated in the study, one can only guess the underlying reasons. It can certainly not be due to a lack of participation in sectorial federations alone. In the case of privately owned companies, ownership structures may be hard to disentangle. It *could* be that none of the companies

[98] We would like to repeat here that at least three of the manufacturers of high clearance tractors we have talked with were completely unaware of this study until we contacted them directly.

that have been contacted is an SME, simply because it is part of a larger group, but the information that is available does not allow us to verify this hypothesis. It could just as well be that these companies are SMEs, but that they have declined to respond. It is then important to understand why.

12.1.3 Cost of providing inputs to studies

Actually, there are several sectors where we can be confident that they are completely dominated by SMEs, even according to the restrictive definition: the **end users**. With the exception of the independent winegrowers, the cableway and ski lift operators, and the inland waterways sectors, the response rate from the sectors that have been contacted has been close to zero, although we are very confident that they are essentially composed of very small enterprises. The responses we have received have also left no ambiguity concerning the reasons for declining to cooperate: **the inputs that were requested were felt to be too technical, and individual companies did not see sufficient benefits from responding to the questionnaires**, compared to the cost involved in answering them. In the case of end users, it is clear that a substantial amount of effort is required to understand the indirect effects of changes that are barely understood by those who will have to implement the technical solutions.

It is possible that, even amongst the manufacturers of equipment, the burden of responding actively to the questionnaire is simply too high compared to the (perceived) benefits of doing so. This could especially be the case for very small companies where the necessary language skills are not present to respond to questionnaires drafted in English. Again, in the absence of explicit statement on why they decline to cooperate, one can only guess the real motivation, but this is certainly one possible explanation we have to take into account.

12.1.4 Lessons learned for future work

What conclusions can we draw for future work?

One possible approach would be to use a **less restrictive definition of SMEs** in future work.

Whilst such an approach could lead to a higher response rate, the valued added is not obvious:

- Relaxing the definition would mean that we would **ignore the two essential problems of SMEs that are solved when they integrate in a larger group** (high fixed costs and difficult access to capital).
- A change of the scope of the definition could lead to **confusion on the side of the industry**. It has taken the project team a lot of effort to explain to the sector federations that they should look at the criterion of financial independence. This confusion could make future similar projects even more difficult to conduct.

The second approach would consist in sticking to the current definition, but to make life easier to the respondents. Several possibilities can be considered here, but none of them seems very realistic:

- As suggested above, we have used UEAPME as an alternative channel to get in touch with SMEs. Initially, UEAPME has indicated that the response time allowed was too short. The extension of the contract has not led to a higher response rate.
- Drafting a questionnaire in several languages (or allowing SMEs to answer in their mother tongue) could maybe decrease the barriers for some SMEs. However, the implications in terms of translation budget and in execution time

could be huge. Limiting the number of languages could be an option, but this obviously raises the question where to put the boundary between the languages that are included in the study and those that are not.

- It is highly doubtful that further simplifications of the questionnaires would lead to a higher response rate. Compared to the questionnaires that we had used in the IA study, the questionnaires used for the SME test were already a drastic simplification. One has to acknowledge that the questions that are tackled in an Impact Assessment Study are complex, and that there are limits to how far we can go in simplifying complex issues without missing the whole point of the study.

12.2 Policy conclusions

The next question is: taking into account the low response rate, what policy conclusions can we draw?

There are essentially two possible approaches to this question:

- The first possibility is to assume that the responses that we have received are indeed representative. This leads to the conclusion that at most 10 European OEM[99] subject to the NRMM Directive are actually SMEs. Taking into account the information that we have found in business directories, we think that this would be an underestimation of the actual number. However, in the absence of any response from the companies that have been contacted directly, and taking into account that the Eurostat data cannot be used as a benchmark (see Section 3.8), we cannot reliably estimate how large this discrepancy is.
- The second possibility is to assume that the companies that have actually responded are only a small subsample of the complete population of SMEs, but that those who have responded are the only ones for which the stakes are sufficiently high to justify an active participation in the study.

However, under both assumptions, the main conclusions remain the same:

- If the current exemption for the stage II emission limits for **tree service chainsaws and hand held hedge trimmers** would not be extended, this would affect the **professional end user market**, which is mostly composed of small business. However, the response rate from the affected sectors was extremely low and we have identified **no information that would lead us to revise the conclusions that were already reached in the IA study**.
- The market for hand held hedge trimmers is shrinking due to the development of battery powered products. It is thus possible that the emission limits related to this equipment become redundant by the end of this decade. No such development is expected for hand held chain saws.
- Some large manufacturers are close to finding technical solutions for stage II for tree service chain saws and hedge trimmers - these solutions will be protected by patents. SMEs are unlikely to be able to develop compliant equipment on their own. Thus, for SMEs, extending the exemption will not solve their specific problems. Taking into account the cost of licenses (10% of the sales price), **SMEs will be at a significant cost disadvantage compared to larger companies who own the intellectual**

[99] Euromot has been clear in that there are no SMEs amongst their members.

property rights. It can be expected that further exit from the market will take place. As we have identified only one OEM that can be classified unambiguously as an SME, the number of jobs at risk at the EU level would lie between the 100 and 200 units.

- In the case of **snowmobiles**, the only SMEs affected are dealers and the professional end users. We have identified **no information that significantly changes the conclusions of the original IA study.**
- We have identified **no SMEs amongst the OEM of construction and agricultural machinery < 19 kW and > 560 kW**.
- A common concern voices by virtually all OEMs that have been interviewed in the course of the study, is the **rapid succession of emission stages** (rather than the absolute values of the imposed emission limits). This affects their business negatively through the following channels: (a) **shorter production runs** to cover the fixed costs of R&D, and of homologation for use on the road (b) the **costs linked to teething problems** of new equipment (this latter issue can also affect the professional end users).
- The most important concern raised by producers of agricultural machinery (including high clearance tractors) was not the next stage in the Directive, but the **homologation process**, and more specifically: the **length of the process**, the **lack of international standardisation** and the fact that **even minor changes require rerunning a complete homologation process**. The possibility to sell non-homologated machines and to use trucks to move them on the road was rejected as unrealistic. One manufacturer has pointed out that the homologation procedures are sometimes circumvented by the end users, who adapt machines to their own needs without any external control.
- Regarding the impact of the Directive on tractors used in orchards, no information (even indicative) has been obtained from the relevant professional organisation of end users. Regarding the impact on tractors used in **vineyards**, the European sector federation has confirmed that all independent winegrowers are SMEs, and the vast majority are micro-enterprises. Using figures on existing public support schemes, we have argued that the **cost for redesigning vineyards to accommodate stage IIIB and IV compliant tractors would be several orders of magnitude larger than the environmental cost of not exempting the special tractors from stage IIIB and IV**. Moreover, such a policy would run counter to the existing policy to stimulate a higher plating density. The alternative option would be for vineyards to keep old tractors in use beyond their economic lifetime. Our calculations suggest that the **increased maintenance cost** following from this option would be **an order of magnitude larger than the environmental cost of not exempting the special tractors from stage IIIB and IV**.
- There are no SMEs involved in the manufacturing of snow groomers. However, in some member states, the professional end users (cableway and ski lift operators) are all SMEs. The **operators** we have interviewed both expect that, if stage IIIB would be introduced according to the existing time schedule, they would **avoid as long as possible buying new snow groomers**. They expect they could to a large extent cover the transition period to stage IV by keeping their existing snow groomers in use beyond their economic lifetime. However, this would come at the price **of increased maintenance and operating costs** that are about 5 times as high as the increase in purchasing costs when a snow groomer is equipped with an SCR.

- In the **IWT** sector, all markets downstream of the engine manufacturers (dealers, shipbuilders, ship-owners) are clearly dominated by very small enterprises. The sector itself has indicated that it expects that the current recession will be followed by an important catching up. It is therefore likely that the first engines complying with the stage IIIB standards will be put on the market after the end of the downturn. By that time, access to capital should have improved as well.
- As about half of the investment cost linked to the CCNR stage IV proposal could be subsidised without exceeding the *de minimis* limits for state aid, it is not impossible that, **in practice, the burden of compliance costs will effectively be shared between taxpayers and the IWT sector**.
- Some small **rail freight operators** fall within the definition of SMEs, but we have identified **no information** that changes the conclusions of the original IA study.

In the case of the IWT sector, we have also indentified the following issues that are independent of the SME test:

- Because the NRMM only applies to new engines, it effectively increases the cost of replacing old engines by new ones. This can lead to a **postponement of the decision to replace these old engines**.
- We have performed some calculations that indicate that **significant environmental benefits** could be obtained from **accelerating the replacement of old engines**, at a cost which would be lower than the cost of complying with the CCNR stage IV proposal. This suggests that other instruments on top of the NRMM Directive (such as incentives to scrap old engines) could reinforce the positive direct effects. However, before firm policy conclusions on this issue can be drawn, it would be necessary to **evaluate the environmental impact of engine production and scrapping**.
- **Cold ironing** has potential as a cost-effective emission reduction strategy for ships at berth.
- **If future legislation would also take into account CO2 emissions**, then consistency would require to also take into account the impact on **other greenhouse gasses**, such as black carbon and tropospheric ozone , which are linked to PM and NOx emissions.
- The testing of engines for type approval takes place with EN590 diesel fuel. However, in operational conditions, other fuel types are supplied. The actual HC, NOx, CO and PM emissions of other fuel types are not well known, and it is **not clear to what extent the real-life emissions of an engine correspond to the emissions measured during the testing**.

This study has considered the two following generic mitigating measures:

- More flexibility in the current small volumes derogation for SI engines.
- An increase in the number of engines that could be put on the market under the flexibility scheme for CI engines.

A **more flexible application of the small volume derogation** would yield **benefits for the manufacturing industry**, but at the **cost of a (probably small) environmental impact**. In contrast, in the ABT scheme used in the US, the environmental effect is neutral when averaged over time and space, while the system also yields benefits in terms of reduced compliance costs.

The main problem with the **small volumes derogation is that this system can only work if it is sufficiently enforced** (which, according to the industry, is not the case

currently). While large companies have the means for monitoring the market, SMEs (for which the derogation had been designed) do not have these.

With respect to **flexibility scheme for CI engines**, we have identified the following additional advantages on top of the advantage already identified in the IA study (flexibility allows to overcome R&D peaks when several products are faced simultaneously with stricter emission limits):

- An increase in the fixed number of engines allowed on the market under the flexibility scheme would allow SMEs to completely **skip the teething problems of new engines**, which would then be entirely borne by the large manufacturers.
- An extension of the duration of the flexibility scheme would allow small equipment manufacturers to **overcome the time lag between the development of a new engine and the full integration of this new engine in the equipment** (including homologation for use on the road). It is not clear to what extent this issue is important in practice: after all, one would expect that engine suppliers could use an active anticipation of this time lag as a competitive advantage.

Another important point to note is that the flexibility scheme leads to distortions in the range of engine types that are put on the market.

Most OEMs that we have interviewed are aware of the flexibility scheme, but not all seem keen on using it. One manufacturer has raised the specific concern that the engine suppliers may not always be able to supply engines complying with the previous stage of the Directive[100].

12.3 The issue of access to funding

As a final point, we would like to remark that, in a few cases, **SMEs have also reported difficult access to capital markets** as a problem. However, **these problems are not caused by the NRMM Directive** as such.

For instance[101], in Germany, medium-sized, family-owned firms are reported to be structurally undercapitalised, mainly because debt financing is more advantageous than equity financing from a tax perspective. In Britain, a lack of competition in company lending could also be an issue. Clearly, these structural issues call for structural measures that lie in completely different policy areas (tax policy and competition policy) than what is covered in this study.

The current financial crisis of course poses specific problems, as has for instance been reported by IWW companies (see Section 10.4). However, it is difficult to see how the policy options that are under discussion in this report could attenuate or aggravate these problems.

In a series of articles published in 2009, *The Economist* has surveyed how the current crunch affects small business.

As early as May 2009, it had already pointed out that, as a consequence of the financial crisis, governments are ordering banks to lend to companies, providing credit guarantees, suspending some tax obligations and forcing public bodies to pay up more quickly[102]. In the United Kingdom, the government has introduced an enterprise-finance guarantee

[100] In some applications, engine manufacturers keep on producing engines complying only with previous stages of the Directive, but these engines are exported to unregulated regions of the world. We have to keep in mind that in niche markets, this outlet of exports outside the EU does not necessarily exist.
[101] The Economist, “Europe's corporate credit crunch. Muck in the fuel pipe” (Dec 10th 2009).
[102] The Economist, “Small businesses in Europe. Humble but nimble” (May 21st 2009)

scheme, which ensures repayment of 75% of a bank loan to eligible small companies[103]. These approaches surely seem a more cost-effective way to reduce the burden of the financial crisis for SMEs.

More recently, a new survey has confirmed that the impact of the financial crisis on small business depends heavily on the local policy context. For instance[104], small businesses in Greece and Croatia say that access to finance is their biggest problem and that credit concerns are high on the list for small firms in France, Hungary and Italy as well. However, *The Economist* also points to the example of Belgium, where the government gives small businesses "pre-funded agreements" that they can present to banks for guaranteed loans and where fewer than 10% of small companies say access to finance is a problem. It also reports that, in Germany, lending by small savings banks, or *Sparkassen*, to small businesses increased by an annual rate of almost 6% in July.

[103] The Economist, "Lending to small companies. Now, worry about the upturn (Nov 19th 2009).
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Directive 2004/26/EC of the European Parliament and of the Council of 21 April 2004 amending Directive 97/68/EC on the approximation of the laws of the Member States relating to measures against the emission of gaseous and particulate pollutants from internal combustion engines to be installed in non-road mobile machinery (OJ L 146, 30.4.2004)

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A Questionnaires for the SME test

Some elements are common to all questionnaires related to the SME test. These common elements have only been represented for the first questionnaire. For some target audiences, several versions of the questionnaire have been circulated, in order to take into account comments on previous versions. Only the most recent version is reported here.

A.1 Questionnaire SME test for engine manufacturers

Dear Madam/Sir

On behalf of the European Commission (Directorate General Enterprise and Industry - DG ENTR), ARCADIS Belgium has recently performed a complete and detailed assessment ("the IA study") of the impacts and distributive effects of possible options for reviewing Directive 97/68/EC (as amended by Directive 2002/88/EC and 2004/26/EC) relating to measures against the emissions of gaseous and particulate pollutants from internal combustion engines to be installed in non-road mobile machinery (hereinafter the "NRMM Directive").

DG ENTR has now awarded a new contract to ARCADIS to complement the existing Impact Assessment Study with a detailed assessment of the specific impacts the identified policy options may have on SMEs.

The objectives of this study are:

- to understand how the identified policy options affect the SMEs in comparison with larger enterprises
- to identify and to asses possible alternative options and mitigating measures for SMEs

The input from field players like you is essential in order to obtain a good understanding of these issues. As your answers will be part of the inputs to the preparation of the legislative process, they can be **important for the future of your business**.

Therefore, we kindly ask you to fill in the questionnaire attached to this letter. This will usually not last longer than 1 hour.

This questionnaire is organised as follows:

- Annex A contains for your information some general information on the NRMM Directive and the steps that have been undertaken until now in its review
- In Annex B, you are requested to identify yourself
- Annex C contains the questionnaire properly speaking.
- Annex D summarizes all the options that have been the subject of the IA study.

Please note that the questionnaire in annex is aimed at engine manufacturers. If you are also an equipment manufacturer, it is possible that you will also receive a similar questionnaire aimed specifically at equipment manufacturers.

Please send the filled out questionnaire by 07 January 2010 to Mr. Laurent Franckx with UEAPME in copy. Any further questions about this questionnaire may be addressed to the same contact person.

If some of your answers can only be provided subject to a confidentiality agreement, please let us know.

(signed)

A. BACKGROUND INFORMATION

Directive 97/68/EC (hereafter 'NRMM Directive') recognizes as a fundamental principle that all persons should be effectively protected against recognized health risks from air pollution and that this necessitates in particular the control of emissions of NO2, particulates (PT) – black smoke and other pollutants (CO, NOX, HC, e.a.). It also aims at

establishing the internal market by harmonizing the laws between Member States, with the protection of environment and health as main objective.

The initial NRMM Directive adopted in 1997 covered compression ignition (CI) engines for land based applications only, and introduced emission limit STAGES I & II for such engines.

The first amendment, Directive 2002/88/EC, enlarged the scope of application to spark ignition (SI) gasoline-fuelled engines up to 18 kW, as they are commonly used in lawn and garden machines (hedge trimmers, brush cutters, lawnmowers, garden tractors, snow blowers, etc.), in light-duty industrial machines (generator sets, welders, pressure washers, etc.) and in light logging machines (chainsaws, log splitters, shredders, etc.), and introduced emission limit stages I & II for these engines.

With a second amendment, Directive 2004/26/EC, engines for Inland Waterway Vessels (IWWV) and for railcars and locomotives were added to the scope of the Directive. That amendment also introduced more stringent emission limit values of exhaust emissions through new emission limit stages for engines already covered by the Directive, which depending on the type of machinery are entering into force following different timetables, the latest by the year 2014. These new emission limit stages are referred to as IIIA, IIIB and IV.

For every type of the engine and machinery covered by the Directive and its amendments, measurement procedures, operating and testing conditions are described in the Directive as well.

The need for considering the inclusion of emission limits for snow groomers and snowmobiles (or snow scooters) are specifically addressed in Article 3 (b) of Directive 2002/88/EC.

Agricultural tractors are covered by European Parliament and Council Directive 2000/25/EC (referring mainly to Directive 97/68/EC) and Commission Directive 2005/13/EC (with a link to Directive 2004/26/EC), in which exhaust emission limits are specified. The classification of agricultural tractors is ruled by Directive 2003/37/EC.

The Commission has to deliver to the European Parliament and Council a technical review as described in Article 3 of Directive 2002/88/EC and Article 2 of Directive 2004/26/EC. All the elements addressed in these articles have to be taken into consideration and, where appropriate, proposals for amending the Directive to be elaborated.

The Technical Review, as presented by DG Joint Research Centre (DG JRC) in its final report of September 2008, has resulted in the following possible options for addressing the elements specified in the review clauses of Directives 2002/88/EC and 2004/26/EC.

- Option 0: ‘no action option’ – retain of the status quo, i.e. no changes to the scope and emission limit stages of the NRMM Directive
- Options 1,2,.,n: possible policy options identified by JRC

The options are described in detail Annex 0 to this letter.

A detailed impact assessment has recently been undertaken by ARCADIS Belgium, addressing the technical, social, environmental and economical aspects of each alternative. The Commission services have judged that this analysis needs to be complemented with a more extended and detailed assessment of impacts related to SMEs (the “SME test”, as specified in the updated Commission’s Impact Assessment Guidelines of 15th of January 2009).

B. IDENTIFICATION OF THE RESPONDENT

1. Name of your company

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2. Contact person

Name:

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Telephone number:

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Mobile number:

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Email:

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3 Size of the company

For the purposes of this study, we use the following classification of SMEs. Please mark with ☒ which is applicable on your company:

Enterprise category	Headcount – Annual Work Unit (AWU)	Annual turnover	or	*Annual balance sheet total*	
Medium-sized	< 250	≤ €50 million	or	≤ *€43 million*	☐
Small	< 50	≤ €10 million	or	≤ *€10 million*	☐
Micro	< 10	≤ €2 million	or	≤ €2 million	☐

Please keep in mind that the EC criteria also require to take into account the data of linked and partner enterprises. Are you linked with or partner of enterprises that do not meet the criteria described above?

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For more details, see:

http://ec.europa.eu/enterprise/policies/sme/files/sme_definition/sme_user_guide_en.pdf

4. List of products manufactured or traded

Please mark with ☒ in the checkbox the engine categories relevant for your company.

Table 1: covered engine categories

Small SI Engines		
	Tree service chainsaws	☐
	Hand held hedge trimmers	☐
Other SI Engines		
	Snowmobiles	☐
Land based compression ignited engines		
	< 19 kW	☐
	19-560 kW	☐
	> 560 kW	☐
Land based compression ignited engines: Special agricultural tractors used in vineyards and orchards		
	T2	☐
	T4.1	☐
	C2	☐
Land based compression ignited engines: Snow groomers		☐
Inland waterway vessels		☐
Railcars		☐
Mainline locomotives		☐
Shunters		☐

C. QUESTIONNAIRE

1. For each engine category in your product range, what is the turnover and the number of engines produced in the EU?

engine category	Turnover	# engines produced

2. How many people do you employ in the production and marketing of this engine category (expressed in Full Time Equivalents or FTEs)? “Direct” employment refers to the number of people who are directly involved in this specific engine category while “indirect” employment refers to overhead staff that you attribute to this engine category. Alternatively, you can use percentages.

engine category	direct employment (FTE or percentage)	indirect employment (FTE or percentage)

3. How are your total sales split up in exports outside the EU and sales within the EU?

engine category	Sales outside the EU	Sales in the EU

4. Could you describe briefly your assessment of the **current** situation in the market(s) you are operating in? Elements that should be taken into account are: existing and potential competition, general growth prospects, maturity of the technology,

engine category	General assessment of the market

5. Do you think you operate in a market where size constitutes a competitive advantage/disadvantage?

To what factors would you ascribe these cost (dis)advantages?

A (non-limitative) list of possible sources for cost disadvantages for small enterprises are:

(a) high share of fixed costs for R&D

(b) high share of fixed costs for marketing

(c) high fixed levels of physical capital

(d) high fixed costs linked to testing and conformity assessment

(e) high fixed costs linked to the understanding of the regulatory context

(f) weak negotiating position with respect to clients or suppliers: difficulties to obtain discounts

(g) difficult access to capital markets

(h) other disadvantages (please detail)

A (non-limitative) list of possible for cost advantages for small enterprises are:

(i) better understanding of a specific niche (geographical or technical)

(j) higher flexibility

(k) other advantages (please detail)

If these cost (dis)advantages depend on the option (see Annex 0), please specify.

Please provide any quantitative information that can help substantiate your appreciation of these (dis)advantages. It would be particularly useful if you could provide a concrete assessment of the compliance costs linked to each option, split up in fixed costs and variable costs. Please express variable costs as unit costs. Let us know if you would only provide this information under a non-disclosure agreement.

engine category	Type of cost (dis)advantage	Cost (dis)advantages, please describe

6. Do you think that, as an SME, you suffer disproportionally from competition by noncompliant manufacturers? If yes, can you briefly explain why? If you think these cost (dis)advantages depend on the option under consideration, please specify.

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7. Can you describe elements in the proposed options or in the baseline option that you think impose a disproportionate burden on SMEs. Please explain why.

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8. Please suggest possible changes in the existing NRMM Directive that would better take into account the specific needs of SMEs? .

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9. Please add any comments on this questionnaire.

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D. POSSIBLE OPTIONS

This annex contains an exhaustive list of all options that have been analysed in the context of the IA study. Option 0 always refers to the existing text of the NRMM Directive.

Small SI Engines		Option 1	Option 2
	Tree service chainsaws	Maintain exemption from stage II emission limits	
	Hand held hedge trimmers		
Other SI Engines			
	Snowmobiles	Align with US legislation except for the averaging, banking and trading (ABT) system with (possibly) a European flexibility mechanism	
Land based compression ignited engines			
	< 19 kW	Align for 0-8 kW and 8-19 kW classes with US emission limits	*Align for the 8-19 kW engine power class with US emission limits; no action for the 0-8 kW engine power class*
	> 560 kW	Delete power cap of 560 kW and create NRMM power	*Keep power cap and create a new engine power class >*

		class > 130 kW	*560 kW*
	All	Increase flexibility and small volume allowance to 50% of one year production	
Land based compression ignited engines: Special agricultural tractors used in vineyards and orchards			
	T2	Exempt special purpose tractors from stage IIIB and IV	
	T4.1		
	C2		
Land based compression ignited engines: Snow groomers		Exempt snow groomers for a limited period of time (exemption of stage IIIB, introduction of stage IV end of 2014 as foreseen)	
Inland waterway vessels		Continue with CCNR stage IIIB and Stage IV proposal to strengthen emission limits	*Continue with Euromot stage IIIB and Stage IV proposal to strengthen emission limits*
Railcars and locomotives		Set the stage IIIB limit for all rail vehicles in 2016	Set the stage IIIB limit for railcars and locomotives > 560 kW in 2016; keep the stage IIIB limit for railcars and locomotives < 560 kW in 2012

A.2 Questionnaire SME test for equipment manufacturers

(pm – same for all questionnaires)

A. BACKGROUND INFORMATION

(pm – same for all questionnaires)

B. IDENTIFICATION OF THE RESPONDENT

(pm – same for all questionnaires)

C. QUESTIONNAIRE

1. For each equipment type using an engine covered by the NRMM Directive, what is the turnover and the number of equipment produced in the EU?

Equipment	Turnover	# equipment produced

2. How many people do you employ in the production and marketing of this equipment type (expressed in Full Time Equivalents or FTEs)? "Direct" employment refers to the number of people who are directly involved in this specific equipment category while "indirect" employment refers to overhead staff that you attribute to this equipment category. Alternatively, you can use percentages.

Equipment type	direct employment (FTE or percentage)	indirect employment (FTE or percentage)

3. How are your total sales split up in exports outside the EU and sales within the EU?

Equipment type	Sales outside the EU	Sales in the EU

4. Could you describe briefly your assessment of the **current** situation in the market(s) you are operating in? Elements that should be taken into account are: existing and potential competition, general growth prospects, maturity of the technology…

Equipment type	General assessment of the market

5. Do you think you operate in a market where size constitutes a competitive advantage/disadvantage?

To what factors would you ascribe these cost (dis)advantages?

(pm – same for all questionnaires)

6. Do you think that, as an SME, you suffer disproportionally from competition by noncompliant manufacturers? If yes, can you briefly explain why? If you think these cost (dis)advantages depend on the option under consideration, please specify.

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7. Can you describe elements in the proposed options or in the baseline option that you think impose a disproportionate burden on SMEs. Please explain why.

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8. Please suggest possible changes in the existing NRMM Directive that would better take into account the specific needs of SMEs?

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9. Please add any comments on this questionnaire.

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D. POSSIBLE OPTIONS

(pm – same for all questionnaires)

A.3 Questionaire for SME test shipbuilders

(pm – same for all questionnaires)

A. BACKGROUND INFORMATION

(pm – same for all questionnaires)

Chapter 3.8 of this study covers the inland waterways sector and contains all the information you need for filling out this questionnaire.

B. IDENTIFICATION OF THE RESPONDENT

(pm – same for all questionnaires)

C. QUESTIONAIRE

1. For each vessel type using an engine covered by the NRMM Directive, what is the turnover and the number of equipment produced in the EU?

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2. How many people do you employ in the production and marketing of this vessel type (expressed in Full Time Equivalents or FTEs)? “Direct” employment refers to the number of people who are directly involved in this specific vessel category while “indirect” employment refers to overhead staff that you attribute to this equipment category.

Vessel type	direct employment (FTE)	indirect employment (FTE)

3. How are your total sales split up in exports outside the EU and sales within the EU?

Vessel type	Sales outside the EU	Sales in the EU

4. Could you describe briefly your assessment of the **current** situation in the market(s) you are operating in? Elements that should be taken into account are: existing and potential competition, general growth prospects, maturity of the technology,

Vessel type	General assessment of the market

5. For each vessel type, can you give an indication of the cost of the engine within the total cost structure of the vessel?

Vessel type	Share of the engine in total cost of vessel

6. How is the current economic crisis impacting upon your business?

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7. Do your currently receive any types of public support? Which type? What do you expected in the future?

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8. Do you think you operate in a market where size constitutes a competitive advantage/disadvantage?

To what factors would you ascribe these cost (dis)advantages?

(pm – same for all questionnaires)

9. Do you think that, as an SME, you suffer disproportionally from competition by noncompliant manufacturers? If yes, can you briefly explain why? If you think these cost (dis)advantages depend on the option under consideration, please specify.

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10. Can you describe elements in the proposed options or in the baseline option that you think impose a disproportionate burden on SMEs. Please explain why.

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11. Please suggest possible changes in the existing NRMM Directive that would better take into account the specific needs of SMEs amongst the shipbuilders?

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12. Please add any comments on this questionnaire.

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A.4 Questionnaire for SME test farmers

(pm – same for all questionnaires)

A. BACKGROUND INFORMATION

(pm – same for all questionnaires)

B. IDENTIFICATION OF THE RESPONDENT

(pm – same for all questionnaires)

C. QUESTIONNAIRE

For each option that has been analysed in the context of the IA study, this annex provides the estimate of the cost linked to this scenario. We refer to the complete IA study for more details:

http://ec.europa.eu/enterprise/mechan_equipment/emissions/impactassessment/nrmm_iastudy_fnrep.pdf

Option 0 always refers to leaving the Directive as it is.

Small SI Engines		Option 0	Option 1	Socio-economic impacts
	Tree service chainsaws	Tree service chainsaws or hand held hedge trimmers are currently exempted from stage II emission limits. This exemption ends in 2011.	Maintain exemption from stage II emission limits	According to industry, option 0 (end of the exemption period in 2011) is not technically feasible. Option 0 would thus lead to the (temporary, until 2014) disappearance of tree service chainsaws and hand held hedge trimmers from the market.
	Hand held hedge trimmers			

Questions

Do any of your members use tree service chainsaws or hand held hedge trimmers? If yes, what would be the implications for their business if these equipment types would no longer be put on the market between 2012 and 2014? How do you think they would cope with it (longer maintenance of existing equipment, replacement by equipment powered by electrical engines…)? Do you have an idea what this would imply in terms of costs?

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	Option 0	Option 1	
Snowmobiles	European legislation currently foresees no emission limits for engines used in snowmobiles.	Align with US legislation except for the averaging, banking and trading (ABT) system with (possibly) a European flexibility mechanism	According to industry, option 1 without flexibility, would lead to a decrease of the product range on offer on the EU market – except for direct injection engines, 2 stroke engines would disappear from the European market. Vehicles would be between 15 and 40% more expensive than the models they replace.

Questions

Do any of your members use snowmobiles? If yes, what would be the implications for their business if only snowmobiles with 4 stroke engines or with 2 stroke engines with direct injection would be put on the market? How do you think they would cope with this (longer maintenance of existing snowmobiles, buy more expensive snowmobiles, replacement by all terrain vehicles…)?

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	Option 0	Option 1	Option 2	
Land based compression ignited engines< 19 kW	No emission limits are set for < 19 kW today	Align for 0-8 kW and 8-19 kW classes with US emission limits	Align for the 8-19 kW engine power class with US emission limits; no action for the 0-8 kW engine power class	For option 1, it is estimated that compliance costs at the European level would increase with 13.6 million EUR per year (for 11 292 pieces of equipment sold annually). Industry claims that producers of very small diesel engines would disappear from the market. For option 2, compliance costs are estimated to be zero.

Questions

It is not clear **whether there is any European market for agricultural applications of very small diesel engines (**< 19 kW). Do you members use equipment with engines in this power category? Could you clarify what type? In case the 0-8 kW power class would be aligned with US emission limits, would it be an option for your members to use instead equipment powered with 4 stroke gasoline fuelled engines? Would it be possible to give an indication of the importance of this equipment category within the total cost structure of your members (preferably split up in: fuel costs, depreciation, maintenance etc)?

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	Option 0	*Option 1*	*Option 2*	
Land based compression ignited engines > 560 kW	No emission limits are set for engines > 560 kW	Delete power cap of 560 kW and create NRMM power class > 130 kW	Keep power cap and create a new engine power class > 560 kW	For option 1, it is estimated that compliance costs at the EU15 level would increase with 1901 million EUR; for option 2, it is estimated that compliance costs at the EU15 level would increase with 381 million EUR. 660 engines are assumed to be sold per year. Industry claims that, in the case of option 1, some manufacturers would exit the European market.

Questions

It is not clear **whether there is any European market for agricultural applications of very large diesel engines** (> 560 kW). Do you members use equipment with engines in this power category? Could you clarify what type (harvesters maybe)? (Please note that it is **engine power** that counts, not the power of all engines combined.) Would it be possible to give an indication of the importance of this equipment category within the total cost structure of your members (preferably split up in: fuel costs, depreciation, maintenance etc)? What would be the implications for their business if these equipment types would no longer be put on the market? How do you think they would cope with it (longer maintenance of existing equipment, replacement by alternative equipment < 560 kW…)?

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		Option 0	Option 1	
Land based compression ignited engines: Special agricultural tractors used in vineyards and orchards				
	T2	Keep the stage IIIB and stage IV emission limits for special purpose tractors as they are.	Exempt special purpose tractors from stage IIIB and IV	According to the industry, the installation of emission reduction technologies requires changes in the shape of tractors, which could result a higher instability of the tractors. There is also a fear that tractor will destroy fruits and grapes. There is therefore a risk that in the short term end users will not buy any special purpose tractors. It is reckoned that the development of technologically suitable solution could take
	T4.1			
	C2			

				5 years.

Questions

If stage IIIB-IV compliant special tractors would indeed not fulfil the user requirements, there are essentially two options for the end user: (a) redesign the vineyard or the orchard to accommodate the new shapes of the tractors (b) maintain the *existing* tractors longer than you would do otherwise (the emission limits only apply to the *new* tractors). What option would you choose? Could you give an indication of what this would imply in terms of costs?

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A.5 Questionnaire for SME test supply industry

(pm – same for all questionnaires)

A. BACKGROUND INFORMATION

(pm – same for all questionnaires)

B. IDENTIFICATION OF THE RESPONDENT

(pm – same for all questionnaires)

Please mark with ☒ in the checkbox the engine categories and/or equipment types for which you act as a supplier.

Table 1: covered engine categories

Small SI Engines		
	Tree service chainsaws	☐
	Hand held hedge trimmers	☐
Other SI Engines		
	Snowmobiles	☐
Land based compression ignited engines		
	< 19 kW	☐
	19-560 kW	☐
	> 560 kW	☐
Land based compression ignited engines: Special agricultural tractors used in vineyards and orchards		
	T2	☐
	T4.1	☐
	C2	☐
Land based compression ignited engines: Snow groomers		☐
Inland waterway vessels		☐
Railcars		☐
Mainline locomotives		☐
Shunters		☐

C. QUESTIONNAIRE

Please substantiate as much as possible the answers you provide with concrete and verifiable figures. References to official statistics and independent publications would be especially useful.

13. Please describe below the type of equipment your produce, and in which applications (as described in Table) they are used.

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For each equipment type, please give the turnover related to this equipment and the number of items produced per year.

Equipment	Turnover	# equipment produced

14. How many people do you employ in the production and marketing of this equipment type (expressed in Full Time Equivalents or FTEs)? "Direct" employment refers to the number of people who are directly involved in this specific equipment category while "indirect" employment refers to overhead staff that you attribute to this equipment category. Alternatively, you can use percentages.

Equipment type	direct employment (FTE)	indirect employment (FTE)

15. How are your total sales split up in exports outside the EU and sales within the EU?

Equipment type	Sales outside the EU	Sales in the EU

16. Could you describe briefly your assessment of the **current** situation in the market(s) you are operating in? Elements that should be taken into account are: existing and potential competition (preferably split up in competition from large

companies versus competition from other SMEs), general growth prospects, maturity of the technology…

Equipment type	General assessment of the market

17. Do you think you operate in a market where size constitutes a competitive advantage/disadvantage?

To what factors would you ascribe these cost (dis)advantages?

A (non-limitative) list of possible sources for cost disadvantages for small enterprises are:

(a) high share of fixed costs for R&D

(b) high share of fixed costs for marketing

(c) high fixed levels of physical capital

(d) high fixed costs linked to testing and conformity assessment

(e) high fixed costs linked to the understanding of the regulatory context

(f) weak negotiating position with respect to clients or suppliers: difficulties to obtain discounts

(g) difficult access to capital markets

(h) other disadvantages (please detail)

A (non-limitative) list of possible for cost advantages for small enterprises are:

(i) better understanding of a specific niche (geographical or technical)

(j) higher flexibility

(k) other advantages (please detail)

If these cost (dis)advantages depend on the option (see Annex 0), please specify.

Please provide any quantitative information that can help substantiate your appreciation of these (dis)advantages. It would be particularly useful if you could provide a concrete assessment of the costs linked to each option under study, split up in fixed costs and variable costs. Please express variable costs as unit costs. Let us know if you would only provide this information under a non-disclosure agreement.

engine category	Type of cost (dis)advantage	Cost (dis)advantages, please describe

18. Do you think that, as an SME, you suffer disproportionally from competition by noncompliant manufacturers? If yes, can you briefly explain why? If you think these cost (dis)advantages depend on the option under consideration, please specify.

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19. Can you describe elements in the proposed options or in the baseline option that you think impose a disproportionate burden on SMEs. Please explain why.

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20. A specific issue of concern that has been raised by some members of the supply industry is that the application of the flexibility mechanism (which is described in detail on p 101 to 109 of the IA study) could lead to disruptions of their own planning process. Can you please clarify your own position on this issue. Please substantiate as much as possible with concrete figures.

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21. Please suggest possible changes in the existing NRMM Directive that would better take into account the specific needs of SMEs in the supply industry?

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22. Please add any comments on this questionnaire.

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D. POSSIBLE OPTIONS

(pm – same for all questionnaires)

A.6 Questionnaire SME test forestry workers

(pm – same for all questionnaires)

A. BACKGROUND INFORMATION

(pm – same for all questionnaires)

B. IDENTIFICATION OF THE RESPONDENT

(pm – same for all questionnaires)

C. QUESTIONNAIRE

For each option that has been analysed in the context of the IA study, this annex provides the estimate of the cost linked to this scenario. We refer to the complete IA study for more details:

http://ec.europa.eu/enterprise/mechan_equipment/emissions/impactassessment/nrmm_iastudy_fnrep.pdf

Option 0 always refers to leaving the Directive as it is.

Small SI Engines		Option 0	Option 1	Socio-economic impacts
	Tree service chainsaws	Tree service chainsaws or hand held hedge trimmers are currently exempted from stage II emission limits. This exemption ends in 2011.	Maintain exemption from stage II emission limits	According to industry, option 0 (end of the exemption period in 2011) is not technically feasible. Option 0 would thus lead to the (temporary, until 2014) disappearance of tree service chainsaws and hand held hedge trimmers from the market.
	Hand held hedge trimmers			

Questions

Do any of your members use tree service chainsaws or hand held hedge trimmers? If yes, what would be the implications for their business if these equipment types would no longer be put on the market between 2012 and 2014? How do you think they would cope with it (longer maintenance of existing equipment, replacement by equipment powered by electrical engines…)

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	Option 0	Option 1	
Snowmobiles	European legislation currently foresees no emission limits for engines used in snowmobiles.	Align with US legislation except for the averaging, banking and trading (ABT) system with (possibly) a European flexibility mechanism	According to industry, option 1 without flexibility, would lead to a decrease of the product range on offer on the EU market – except for direct injection engines, 2 stroke engines would disappear from the European market. Vehicles would be between 15 and 40% more expensive than the models they replace.

Questions

Do any of your members use snowmobiles? If yes, what would be the implications for their business if only snowmobiles with 4 stroke engines or with 2 stroke engines with direct injection would be put on the market? How do you think they would cope with this (longer maintenance of existing snowmobiles, buy more expensive snowmobiles, replacement by all terrain vehicles…)?

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	Option 0	Option 1	Option 2	
Land based compression ignited engines< 19 kW	No emission limits are set for < 19 kW today	Align for 0-8 kW and 8-19 kW classes with US emission limits	Align for the 8-19 kW engine power class with US emission limits; no action for the 0-8 kW engine power class	For option 1, it is estimated that compliance costs at the European level would increase with 13.6 million EUR per year (for 11 292 pieces of equipment sold annually). Industry claims that producers of very small diesel engines would disappear from the market. For option 2, compliance costs are estimated to be zero.

Questions

In case the 0-8 kW power class would be aligned with US emission limits, would it be an option for your members to use instead equipment powered with 4 stroke SI engines? Would it be possible to give an indication of the importance of this equipment category within the total cost structure of your members (preferably split up in: fuel costs, depreciation, maintenance etc)?

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	Option 0	*Option 1*	*Option 2*	
Land based	No	Delete	Keep	For option 1, it is estimated that compliance

compression ignited engines > 560 kW	emission limits are set for engines > 560 kW	power cap of 560 kW and create NRMM power class > 130 kW	power cap and create a new engine power class > 560 kW	costs at the EU15 level would increase with 1901 million EUR; for option 2, it is estimated that compliance costs at the EU15 level would increase with 381 million EUR. 660 engines are assumed to be sold per year. Industry claims that, in the case of option 1, some manufacturers would exit the European market.

Questions

Do you members use equipment with engines in this power category? Could you clarify what type? Would it be possible to give an indication of the importance of this equipment category within the total cost structure of your members (preferably split up in: fuel costs, depreciation, maintenance etc)? What would be the implications for their business if these equipment types would no longer be put on the market? How do you think they would cope with it (longer maintenance of existing equipment, replacement by alternative equipment < 560 kW…)

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A.7 Questionnaire SME test for landscape workers

(pm – same for all questionnaires)

A. BACKGROUND INFORMATION

(pm – same for all questionnaires)

B. IDENTIFICATION OF THE RESPONDENT

(pm – same for all questionnaires)

C. QUESTIONNAIRE

For each option that has been analysed in the context of the IA study, this annex provides the estimate of the cost linked to this scenario. We refer to the complete IA study for more details:

http://ec.europa.eu/enterprise/mechan_equipment/emissions/impactassessment/nrmm_iastudy_fnrep.pdf

Option 0 always refers to leaving the Directive as it is.

Small SI Engines		Option 0	Option 1	Socio-economic impacts
	Tree service chainsaws	Tree service chainsaws or hand held hedge trimmers are currently exempted from stage II emission limits. This exemption ends in 2011.	Maintain exemption from stage II emission limits	According to industry, option 0 (end of the exemption period in 2011) is not technically feasible. Option 0 would thus lead to the (temporary, until 2014) disappearance of tree service chainsaws and hand held hedge trimmers from the market.
	Hand held hedge trimmers			

Questions

Do any of your members use tree service chainsaws or hand held hedge trimmers? If yes, what would be the implications for their business if these equipment types would no longer be put on the market between 2012 and 2014? How do you think they would cope with it (longer maintenance of existing equipment, replacement by equipment powered by electrical engines…)? For each impact, would it be possible to describe the financial implications?

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	Option 0	Option 1	Option 2	
Land based compression ignited engines used in agriculture and construction < 19 kW	No emission limits are set for < 19 kW today	Align for 0-8 kW and 8-19 kW classes with US emission limits	Align for the 8-19 kW engine power class with US emission limits; no action for the 0-8 kW engine power class	For option 1, it is estimated that compliance costs at the European level would increase with 13.6 million EUR per year (for 11 292 pieces of equipment sold annually). Industry claims that producers of very small diesel engines would disappear from the market. For option 2, compliance costs are estimated to be zero.

Questions

In case the 0-8 kW power class would be aligned with US emission limits, would it be an option for your members to use instead equipment powered with 4 stroke SI engines? Would it be possible to give an indication of the importance of this equipment category within the total cost structure of your members (preferably split up in: fuel costs, depreciation, maintenance etc)?

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A.8 Questionaires SME test for construction companies

(pm – same for all questionnaires)

A. BACKGROUND INFORMATION

(pm – same for all questionnaires)

B. IDENTIFICATION OF THE RESPONDENT

(pm – same for all questionnaires)

3. Description of sector

Can you briefly describe your sector (activities, employment, market trends) and the relative importance of SMEs within the sector (expressed in employment, value added etc)?

Please use the EC definition for SMEs, which requires to take into account the headcount, turnover and balance sheet total of partner and linked enterprises. See:

http://ec.europa.eu/enterprise/enterprise_policy/sme_definition/index_en.htm

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C. QUESTIONNAIRE

For each option that has been analysed in the context of the IA study, this annex provides the estimate of the cost linked to this scenario. We refer to the complete IA study for more details:

http://ec.europa.eu/enterprise/mechan_equipment/emissions/impactassessment/nrmm_iastudy_fnrep.pdf

Option 0 always refers to leaving the Directive as it is.

	Option 0	Option 1	Option 2	
Land based compression ignited engines< 19 kW	No emission limits are set for < 19 kW today	Align for 0-8 kW and 8-19 kW classes with US emission limits	Align for the 8-19 kW engine power class with US emission limits; no action for the 0-8 kW engine power class	For option 1, it is estimated that compliance costs at the European level would increase with 13.6 million EUR per year (for 11 292 pieces of equipment sold annually). Industry claims that producers of very small diesel engines would disappear from the market.

				For option 2, compliance costs are estimated to be zero.

Questions

In case the 0-8 kW power class would be aligned with US emission limits, would it be an option for your members to use instead equipment powered with 4 stroke SI engines? Would it be possible to give an indication of the importance of this equipment category within the total cost structure of your members (preferably split up in: fuel costs, depreciation, maintenance etc)?

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	Option 0	*Option 1*	*Option 2*	
Land based compression ignited engines > 560 kW	No emission limits are set for engines > 560 kW	Delete power cap of 560 kW and create NRMM power class > 130 kW	Keep power cap and create a new engine power class > 560 kW	For option 1, it is estimated that compliance costs at the EU15 level would increase with 1901 million EUR; for option 2, it is estimated that compliance costs at the EU15 level would increase with 381 million EUR. 660 engines are assumed to be sold per year. Industry claims that, in the case of option 1, some manufacturers would exit the European market.

Questions

Do you members use equipment with engines in this power category? Could you clarify what type? Would it be possible to give an indication of the importance of this equipment category within the total cost structure of your members (preferably split up in: fuel costs, depreciation, maintenance etc)? What would be the implications for their business if these equipment types would no longer be put on the market? How do you think they would cope with it (longer maintenance of existing equipment, replacement by alternative equipment < 560 kW…)

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