

VREF 2011 Centre of Excellence Workshop

# Appraising Major Projects to meet the Environmental and Social Dimensions of Sustainability using Multiple Criteria Analysis

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- Introduction to the OMEGA RAMP study
- Summary of Questionnaire findings
- Study challenges
- Appraisal systems and current approaches to MCA
- Issues in use of MCA Systems
- Possible use of MCA in RAMP handbook
- Conclusions

# Incorporating Principles of Sustainable Development within Design & Delivery of Major Projects

- Clients:
  - The Institution of Civil Engineers
  - The Actuarial Profession
- Focus
  - Risk Analysis & Management for Projects Handbook – RAMP
- Aim
  - To incorporate principles of sustainable development within the design & delivery of major projects
- Time
  - 18 months: January 2009 – June 2010

# Steps & deliverables

- Step 1
  - Preparation of inception report ***Inception Report***
- Step 2
  - Literature reviews ***Literature Review Report***
- Step 3
  - Questionnaire investigations & analyses ***Survey Report***
- Step 4
  - Appraisal framework & development
  - Seminar
- Step 5
  - Synthesis & reporting ***Final Report***
  - + ***New RAMP Handbook chapter***

# The RAMP (Risk Analysis and Management for Projects) Handbook

- The latest edition of the RAMP Handbook was published in 2005 by Thomas Telford publishers.
- The Handbook is directed towards those engaged in the appraisal and management of project risk, anywhere in the world.
- The RAMP process takes a 'whole lifetime' strategic approach to risk, and especially targets possible financial implications.
- It appears particularly oriented towards decision-makers, including project sponsors and investors in the private sector.

## Step 2 – Literature reviews

- Seven sectoral papers on treatment of environmental & social concerns in project appraisal from viewpoints of:
  - economist – actuary – civil engineer – transport planner – environmental planner – social & community planner – city & regional planner
- One overview paper:
  - perspectives of sustainability visions as applied to MUTPs
- All papers prepared by invited contributors from academic or consultancy backgrounds
- ***Literature Review Report***
  - synthesis of preceding contributions
  - compare and contrast study of each contribution
  - plus material from main OMEGA study of MUTPs

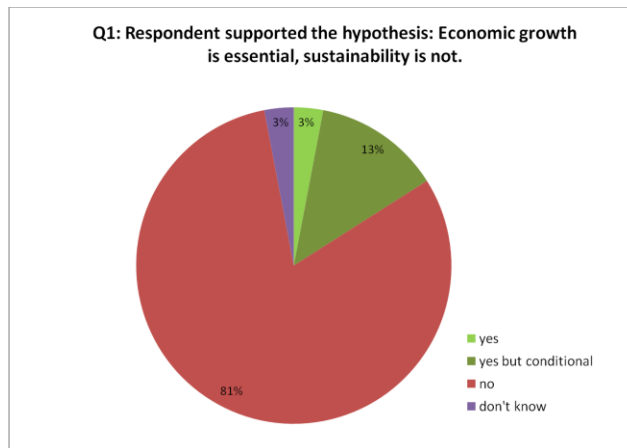
## Step 3 – Questionnaire investigations - surveys

- Aim: 60 interviews with key people from banks, public bodies, development agencies, consultancies & NGOs
  - 40 Hypothesis-led + 20 Pre-Hypothesis = 60
  - actual achieved 44 H-L + 14 P-H = 58
- Agencies / institutions - UK & international
  - target 20 Hypothesis-led total
  - actual 26 Hypothesis-led
    - 15 UK + 11 international
- Case studies - UK & international
  - target 20 Pre-Hypothesis + 20 Hypothesis-led = 40 total
  - actual 14 Pre-hypothesis & 18 Hypothesis-led = 32 total
    - UK, France, Sweden, USA

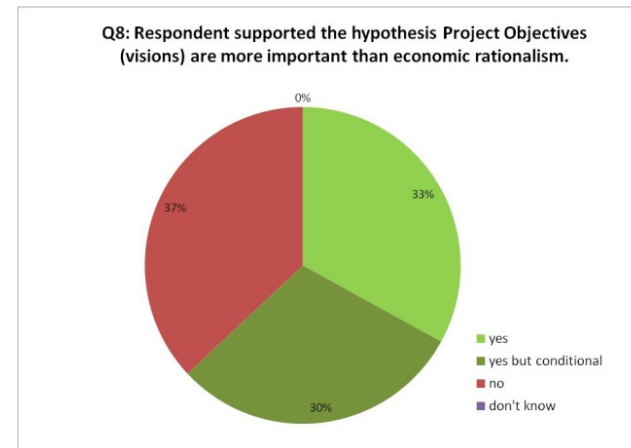
# Step 3 – Questionnaire surveys – findings +

Responses to four key hypotheses:

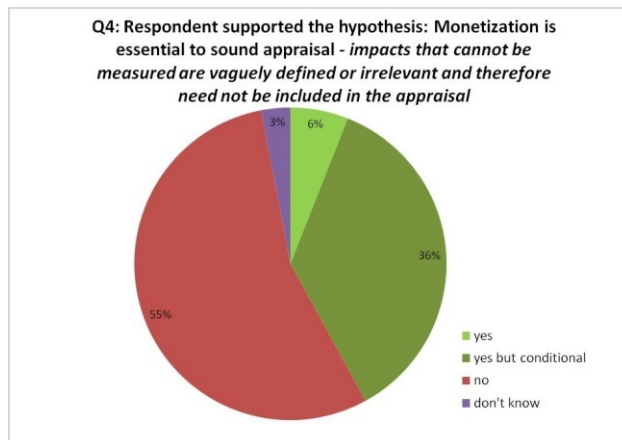
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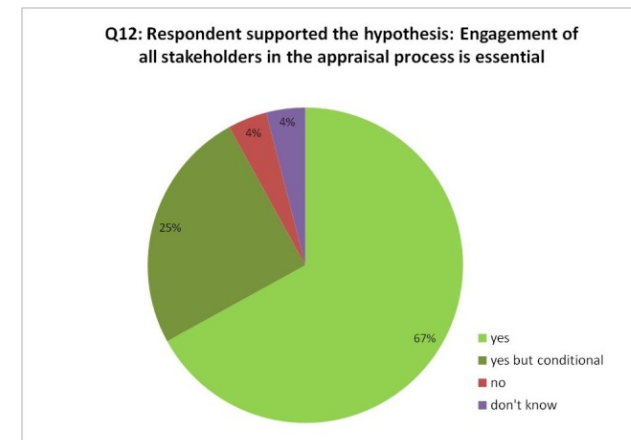
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## Selected survey findings from Step 3

- OMEGA Survey: Only 11% of respondents felt all Social and Environmental aspects of Sustainable can be monetized
- Definitions of aspects of S&E aspects of SD vary with stakeholder and are in constant flux
- OMEGA Survey: Only 23% unconditionally agree appraisal of mega transport projects should be **primarily** focused on the Cost Benefit Analysis (CBA)
- OMEGA Survey: 84% think CBA does not addresses well E&S aspects of SD

## Selected survey findings from Step 3

- OMEGA Survey: 65% think appraisal of mega transport projects would more effectively employ the use of MCA to cover all factors, rather than an exclusive use of CBA.
- OMEGA Survey: 70% of respondents feels CBA should be used to inform MCA based appraisal, rather than principle tool for decision making
- OMEGA Survey: 69% felt public authorities should set clear and firm priorities for appraisal of environmental and social enhancement
- OMEGA Survey: 92% felt context, cultural, political, commercial, temporal - was important for the planning, appraisal and delivery of MUTPs

# The Challenges

- The study highlights the fact that the numerous challenges of sustainable development have the potential to re-define the order of development priorities that major infrastructure projects *should* contribute to
- For example, international concerns over global challenges such as climate change and energy depletion have led to the evolution and implementation of new international and national policies and to follow-up development projects focused on actions to tackle these challenges.
- The Study also highlights that environmental and social factors are *not* externalities to development but instead comprise fundamental components of the context within which sustainable development must be achieved.

## The challenges cont.

- The Study acknowledges that decision-making in mega project planning and appraisal frequently requires major trade-offs and compromises in order to effectively achieve project aims and objectives.
- In response it concludes that managing the risks, uncertainties and tensions generated by these trade-offs requires institutional capacities and transparent governance frameworks that suitably reflect the different perspectives of key project stakeholders involved in project developments in all phases.
- However the Study notes that the institutional frameworks for many major infrastructure projects are instead often too fragmented and silo-based to arrive at acceptable compromises and short of suitably qualified staff to tackle the challenges they confront.

## The challenges cont.

- The Study also highlights the fact that views on what sustainability *actually* involves, and how major infrastructure projects *might* be best framed to achieve goals of sustainability, not only differ from context to context but also require an understanding of how far the operationalization of the concept of sustainability is still in its infancy
- Therefore project appraisal criteria are likely to evolve over time as new knowledge and understandings are acquired. Noting these circumstances often spawn doubts over the extent to which current project appraisal frameworks satisfactorily address the environmental and social dimensions of sustainability as new knowledge and intelligence about these fields develop.
- In consequence the Study Team advocate that such projects need to be seen more as 'innovation projects' than engineering projects, with all that this entails.

# The case for broader appraisal

- where private sector funds are invested in project, a financial appraisal of the forecast cash flows is *always* required to demonstrate return on investment.
- Social CBA is often required by public bodies as a valuable discipline in allocating funds across different fields (e.g. transport, health and education). The central concern is that CBA should not be central to the overall appraisal but should be set within a wider assessment framework, which properly reflects the full range of environmental and social factors.
- Environmental factors which cannot be quantified are not monetised and thus are too often not taken into account. In the case of social factors, even where monetary values can be attributed, critical questions remain over distributional effects, i.e. the varying impacts on different communities and on different societal groups.

## The case for broader appraisal cont.d

- traditional (social) CBA often results in a lack of transparency in the monetization efforts. decision-makers cannot properly understand the project dimensions and their impacts or balance the interests and priorities of differing stakeholders throughout the project lifecycle.
- incorporating environmental and social factors of SD within projects requires a broad and clear understanding of the multiplicity of key decision-making factors and should go well beyond economic concerns
- Appraisal needs to reflect project policy contexts and directives, and to allow for the full engagement of key stakeholders as early in the project lifecycle as possible.
- The aim should be to contribute positively to SD, not just to mitigate negative impacts or avoid difficult decisions. **Multi Criteria Analysis is eminently suited to providing these qualities.**

# Current Approaches to MCA

- Multi Criteria Analysis (MCA) systems are widely used in project appraisal
- MCA systems involve structures to allow quantified and non-quantified indicators to be set out together in a tabulated form
- Decision makers gain a complete picture of the implications of a project across all possible fields of impact.
- Highway investment appraisals use MCA techniques which take into account impacts with both monetary values (such as travel time savings), and social and environmental impacts (noise impacts and blight) which may be quantified but not valued, or assessed only in qualitative terms.

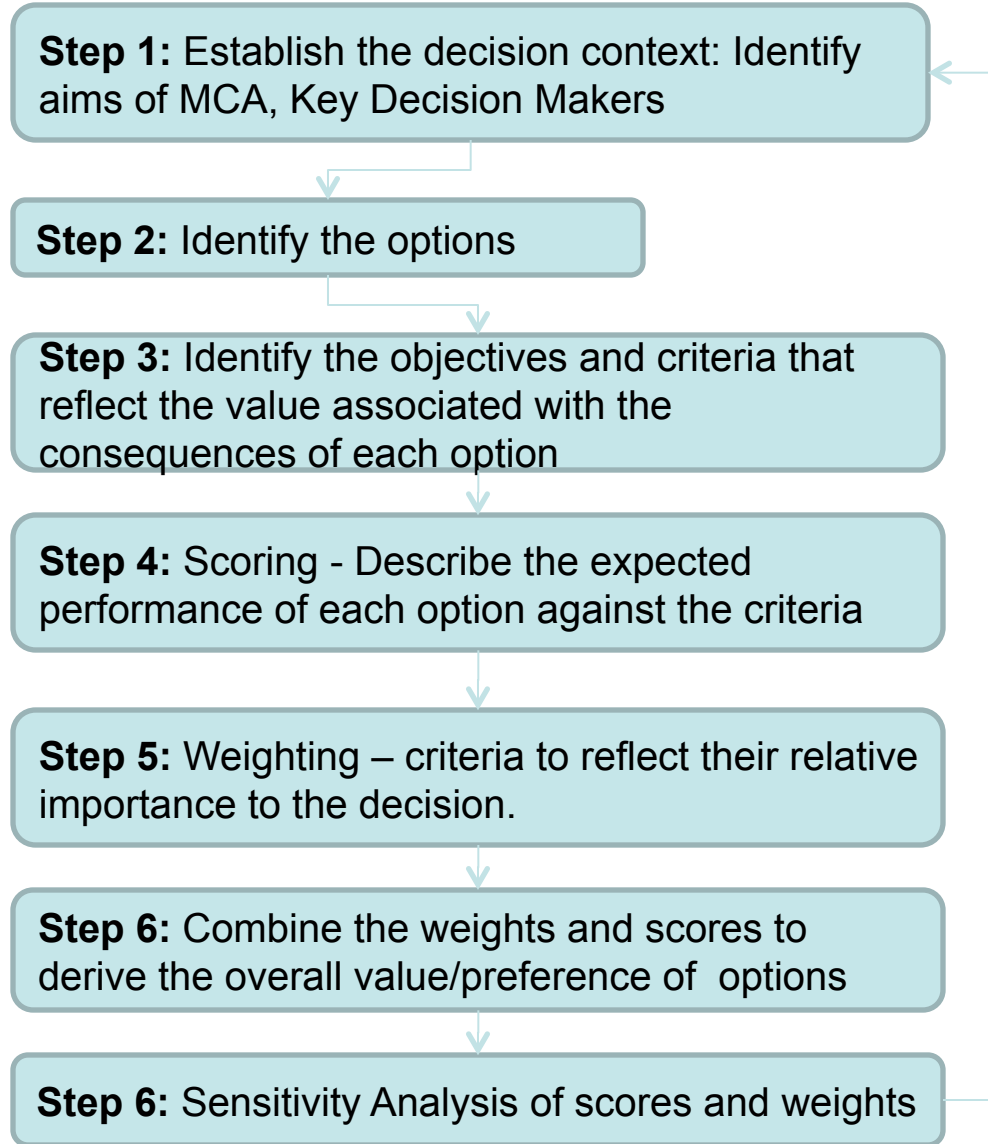


## Current Approaches to MCA cont.d

- MCA aims to establish preferences between **options** using an explicit set of **objectives** that the decision making body has identified, and for which it has established **measurable criteria** to assess the extent to which the objectives have been reached.
- gives the decision-makers the opportunity to learn about their own preferences and those of the involved stakeholders.
- It is likely to be most effective when appraisal is integrated within the overall development and decision making process for a project.

# Current Approaches to MCA cont.d

## Form of Generic MCA



## Current Approaches to MCA cont.d

- MCA in the UK: New Approach to Transport Assessment (NATA) .  
Controversial application of MCA used here as an example.
- Core to NATA MCA: An Appraisal Summary Table (AST) that displays the degree to which the five Central Government objectives for Sustainable Transport would be achieved (policy led).
- AST allows judgement to be made about the overall value-for-money of the option or options in achieving the Government's Sustainable Transport objectives.
- AST “allows consistent view to be taken about the value of the strategies and plans developed for the different study areas”.

<b>Scheme Name</b> A46 Newark - Widmerpool Imp.	<b>Description :</b> Dual-2 lane, grade separated carriageway; mainly on-line with off-line sections at Kinoulton, Bingham, Syerston and Farndon.	<b>Problems :</b> Poor accident record and suffers from congestion. Significant development pressures at Bingham and a need for better links to Newark and Lincoln.	<b>Cost £m :77</b>
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OBJECTIVE	SUB-OBJECTIVE	QUALITATIVE IMPACTS	QUANTITATIVE MEASURE	ASSESSMENT
ENVIRONMENT	Noise	Changes considered at properties having a noise level greater than 57dB and an increase of 1.0dB or more. No allowance has been made for any potential mitigation measures. Decreases due to bypass sections.	Estimated number of people likely to be annoyed by noise levels are: 242 for the "do minimum" situation; 183 for the "do something" situation.	A net decrease of 59 people who would be annoyed by noise in the "do something" situation compared to the "do minimum".
	Local Air Quality	"The project leads to an increase in PM10 levels of at least 2µg/m3 and in NO2 levels of at least 4µg/m3 and concentrations are above the air quality standards NO2 objective of 40µg/m3."	No. properties experiencing air quality - better 305 (NO2) / 519 (PM10) - worse 232 (NO2) / 18 (PM10)	-380 PM10 -3882 NO2
	Greenhouse Gases	12% increase	Difference is + 6252 tonnes CO2	Adverse
	Landscape	A landscape travelled and fought over historically but now managed intensively although appearing quite well wooded. Long views and rolling varied landform give some interest	-	Moderate adverse
	Townscape	Assessed in Landscape	-	Included in Landscape
	Heritage of Historic Resources	An area rich in remains of various periods, esp Roman and Civil War. Many sites likely to be affected since even detailed surveys do not reveal more than 50% of sites found in practice	-	Moderate adverse
	Biodiversity	A substantially agricultural landscape where small pockets of woodland are probably of heightened significance. NB desk search may not include all second tier nature conservation sites.	-	Slight Adverse
	Water Environment	There are several high quality watercourses providing abstractions and dilution of discharges for the area that will be affected by the scheme. Groundwater is also abstracted for industrial and agricultural use. Impacts must be minimised, by mitigation, to protect this environment.	-	Slight Adverse
	Physical Fitness	New opportunities for both pedestrians and cyclists, therefore improving physical fitness.	-	Slight Beneficial
	Journey Ambience	Improved journey ambience for both road users using the bypasses and pedestrians and cyclists within the village boundaries.	-	Moderate Beneficial
SAFETY	-	Substantial improvements to safety by up-grading of current sub-standard single carriageway to dual carriageway and the incorporation of a number of localised bypasses.	Accidents Deaths Serious Slight 1515 n/a n/a n/a	PVB £45.6m
ECONOMY	Journey times & Vehicle op Costs	No VOC calculations made.	Trunk road journey time savings: Peak 19.8 mins; inter peak 4.2 mins	PVB £67.60m 204% of PVC
	Cost	N/A	-	PVC £33.1m
	Journey time reliability			
	Regeneration	Provides link to Newark and Cotgrave both with SRB funded programmes.	Serves regeneration priority area? Development depends on scheme?	Yes No
ACCESSIBILITY	Option values	No new alternative modes provided or additions/removals of existing bus/rail services	-	Neutral
	Severance	Benefits on communities such as Eastside and Farndon outweighed by increased difficulties in crossing the dual carriageway.	-	Slight Adverse
	Access to the Transport System	No provisions for improved access, frequency or routing of existing services nor introduction of new services. Quality of bus stop facilities may improve but access between bus stops remains difficult.	-	Slight Adverse
INTEGRATION	Transport Interchange	No specific improvements to interchange facilities.	-	Neutral
	Land-Use Policy	Consistent with some Land Use policies in Structure Plan and Local Plan, but no specific policies related to the proposed scheme	-	Slight Beneficial
	Other Government Policies	Supports general transport Government policies.	-	Slight Beneficial

COBA	PVB: £113.2m	PVC: £33.1m	NPV: £89.1m	BCR: 8.9
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# Benefits/Issues in use of MCA systems

- **MCA provides a framework which is useful for classification:** determining priorities or selecting between alternatives. There is a degree of judgement which can be a matter of concern, but MCA can bring a degree of structure, analysis and openness to classes of decision which lie beyond the practical reach of CBA.
- **The use of MCA tools is particularly valuable for the direct participation of stakeholders,** as it allows for visualizing different perceptions of the relative importance of the criteria by different groups (businesses, public authorities and community groups in the areas affected, as well as the project sponsors and supporters) highlighting how results can change if different stakeholders' interests and perceptions are taken into account - but how/who selects participants?
- **MCA techniques help illustrate the solution to a multi-criteria problem.** But they also give the decision-makers the opportunity to learn about their own preferences and those of the involved stakeholders. In consequence the MCA approach can prove a valuable instrument for assessing sustainability and also for carrying out the decision process and consensus building in a 'sustainably sound' way.

## Benefits/Issues in use of MCA systems cont.d

- **The MCA approach can be used with considerable flexibility.** It allows engagement of all interested parties and should encourage thinking rather than provide a simplistic guide to the ‘right’ answer. This sets it in contrast to the use of CBA techniques alone.
- **The results of CBA appraisals, so important for particular key investors and project sponsors, are assigned the appropriate priority** in the context of overall policy priorities and against goals of sustainable development at the different stages of the RAMP project management process.
- **The employment of sound objectives, beyond concern with purely financial market fundamentals** and reflecting established policy objectives surrounding the project – local, national, international.

## Benefits/Issues in use of MCA systems cont.d

- **MCA techniques require the disciplined use of analysis and measurement as far as these may usefully be employed.** The use of these techniques is in important ways more demanding of experience and good training than the use of CBA or CEA. For example NATA has been criticized for the inconsistent nature of its implementation to projects both within single scheme and appraisals, and between appraisals
- **The MCA process has the disadvantage that it can be manipulated** either through the choice of representative stakeholder groups, which may not be inclusive, through the choice of criteria and/or balance of these in proportion to the project objectives. Or the stakeholder groups may have a prior agenda which unduly influences the outcome of the MCA.

## Benefits/Issues in use of MCA systems cont.d

- **One important lesson from the current application of the NATA MCA** is that the weightings given to objectives by decision makers are left open, and tend to be dominated by transport sector CBA concerns leading to the dominance of time savings in appraisals and the diminished importance of the underlying objectives. This leads to the question of who is best place to define such weightings? 69% of respondents felt public authorities should set clear and firm priorities for appraisal of environmental and social enhancement.
- **CBA in an important part of appraisal, but should not dominate**

Option	Appraisal typology
1	CBA Led
2	MCA – CBA Led
3	MCA – Non CBA Led
4	MCA – Sustainable Development Policy Led incorporating CBA inputs



# Benefits/Issues in use of MCA systems

- **Engagement of stakeholders throughout the project lifecycle**, allowing significant issues and information to be brought out at specific stages.
- **The framework can help identify project risks** and for seeking trade-offs in moving towards decisions while effectively involving all project stakeholders. A process of this kind, supported by the RAMP Process, provides invaluable guidance in the choice and design of the project and in the treatment of the social and environmental risks of sustainable development.
- **Failure to approach the project's development in this way can mean a failure to reflect key issues in decision-making** and thus may generate increased risks of delay and loss.

# Key Study Conclusions

- **The conventional view that economic growth should be dominant in project appraisal is held by *hardly anyone*** in so far as sustainability is now seen as fundamental by most people involved in mega infrastructure project development, while economic growth is no longer accepted as an end in itself.
- **Sustainable development has been increasing in importance over the last twenty years** with global and national policies developed to focus on it and appraisal methodologies gradually taking into account concerns for the operationalization of this vision/concept.
- **Very few practitioners now see monetization of factors as a pre-requisite to sound appraisal.** Having said this, views remain divided on its significance. Some, albeit a small minority, think that *everything* can ultimately be expressed in monetary values. Many others consider that this practice outside other concerns cannot and does not produce sound figures for appraisal and that it may actually prevent decision makers from properly understanding the balance of the various factors.

## Key Conclusions #2

- **Although substantial research continues on establishing sound monetary values for environmental and social factors, practical difficulties exist**, even over some of the simpler physical environmental factors. For social factors, even where monetary values can be attributed there remain questions over distributional effects.
- **Firm objectives for projects are seen as important by a majority of practitioners but there is some caution over their role.** There are also differences over the extent to which environmental and social criteria can be measured and which ones should have priority.
- **Using Multi Criteria Analysis (MCA) in project appraisal is widely supported**, as this is seen to offer scope for addressing a wide range of objectives in a structured way. It is also seen to allow for a clear identification of factors and issues in a way that is *not* possible with traditional appraisal methodologies.

## Key Conclusions #3

- **There is very strong support for project stakeholders being involved in the development and appraisal of mega projects from an early stage.** It is recognised, however, that not all stakeholders can play an equal role and that a careful management of the project stakeholder engagement process is thus essential.
- **The realization that engaging project stakeholders does *not* mean that all their aspirations can be met is critical.** This is important since different groups are likely to have different aims, and because it is very likely that some will be disappointed by the final outcome of the decision process.

# Contact Details

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